JANUARY, 1955

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

OUR 20th ANNIVERSARY YEAR

TORIAL: A Long Look and A Good Look

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TALK OF THE MONTH
DEFENSE PREPAREDNESS

•

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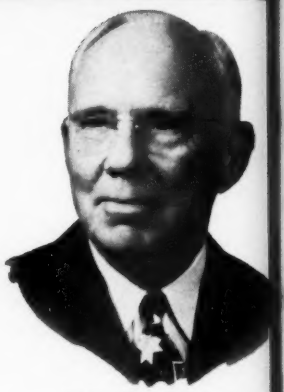

HARVEY B. WALLACE
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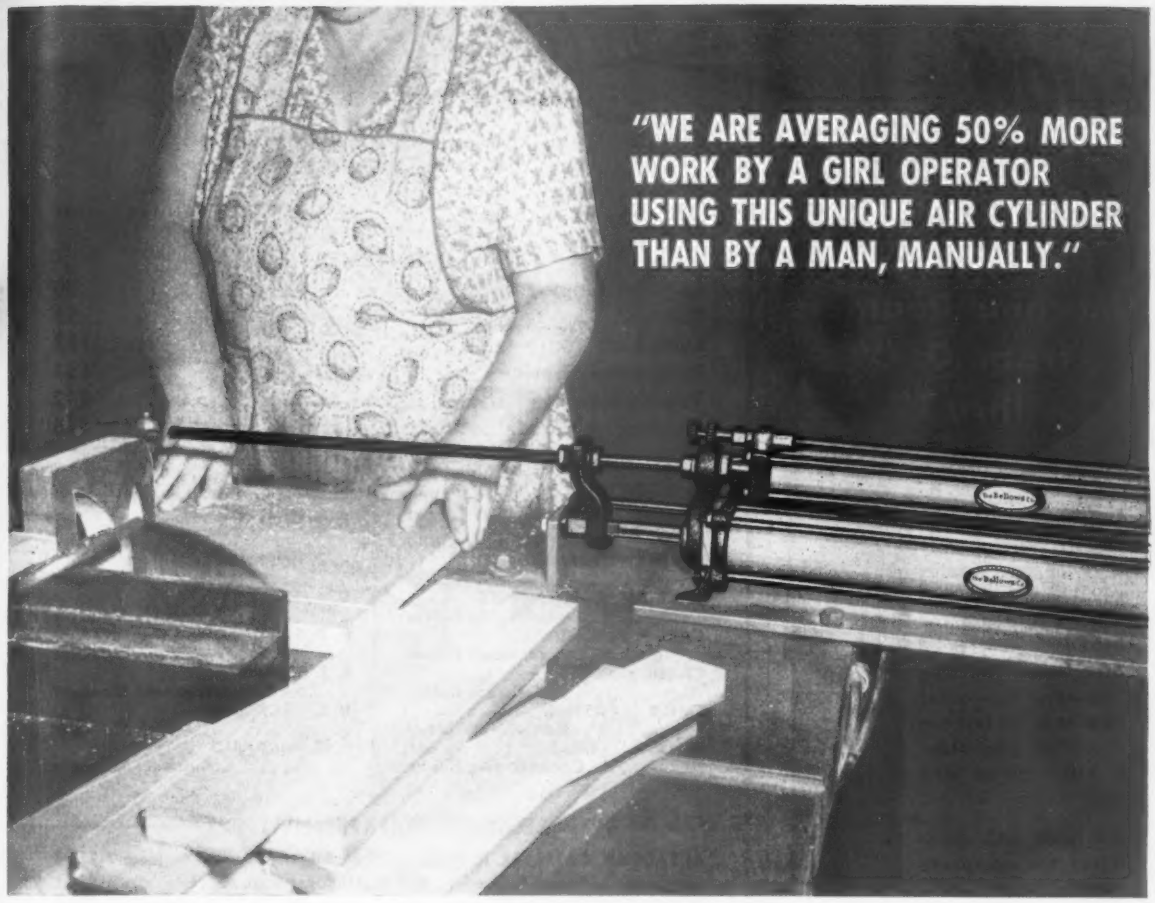

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The Magazine of Manufacturing Management
formerly
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TOOL & DIE JOURNAL 1941-51

VOL. XX—No. 10 JANUARY, 1955

CONTENTS

Editorial Index 50
Editorial 53
Shop Aids 133
Publication Previews 134
What's New in Plastics? 142
Progress on Parade 146

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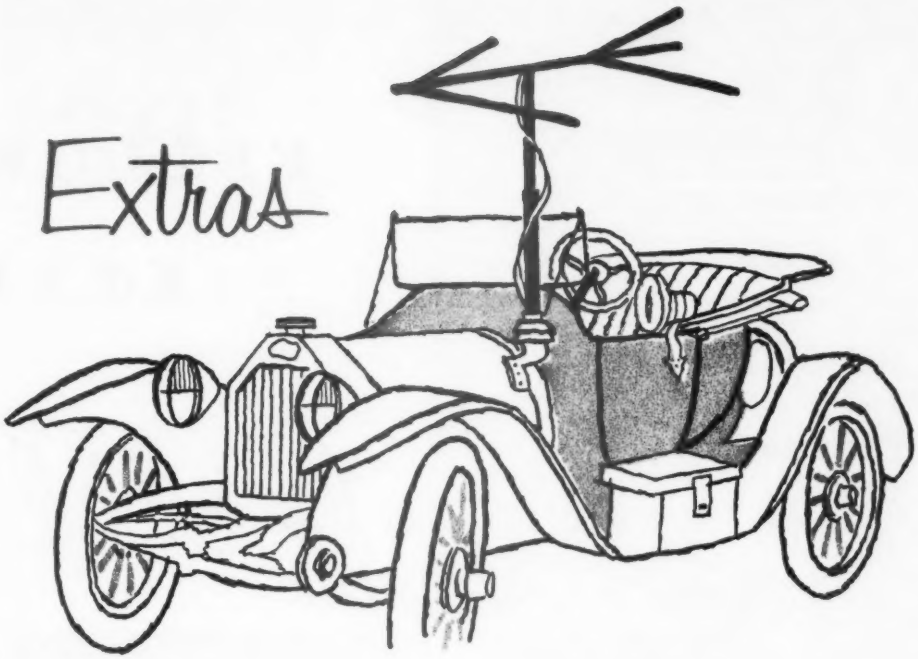

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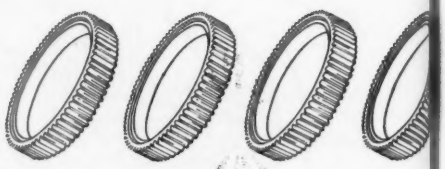

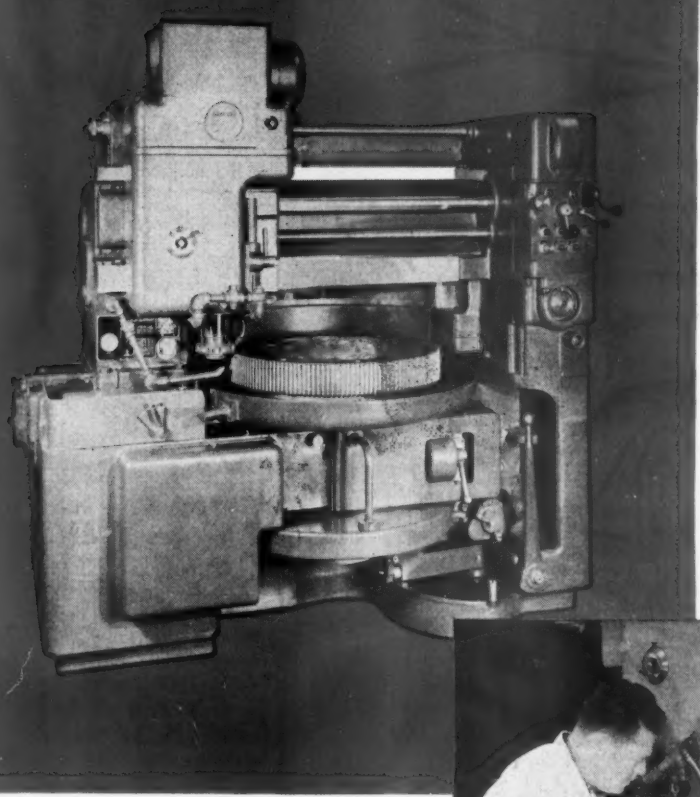

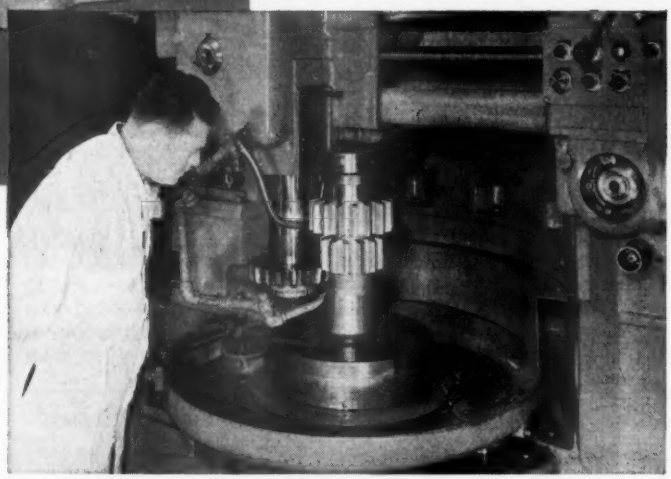

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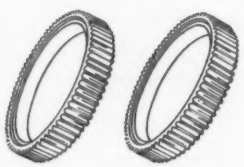

whether it's 6,000 of one
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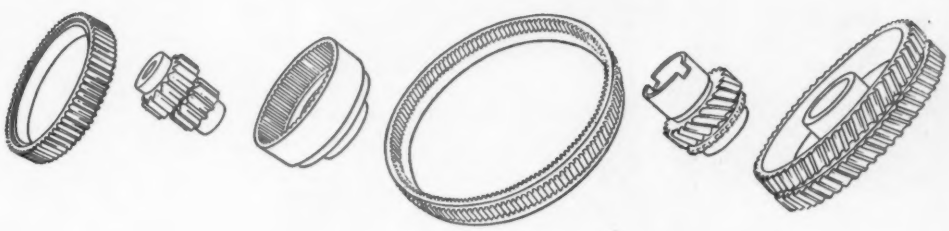

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

THE CRYSTAL BALL*

by Herbert L. Tigges
Executive Vice President
BAKER BROTHERS, INC.
Toledo, Ohio

NEVER BEFORE has the crystal ball been as clouded as it is at this particular time.

Over most of the years of the past history of our country, when we tried to estimate what might happen in the future, we were concerned chiefly with domestic economic and political factors.

But today there is one major factor, looking toward tomorrow, which over-shadows all others — a factor which we have never had to consider before. It is this:

What are we going to do if we are subjected to an attack by a foreign power right here at home, where we live?

In neither World War I nor World War II did we seriously consider that possibility. But today, it is a threat extending into the indefinite future.

Today I want to review the machine tool situation from that point of view.

Let's start with the subject of the machine tool reserve.

Fortunately our government, as a result of the World War II and Korean crises, has at long last recognized the fact that machine tools are one of the basic foundations of national defense.

It was proposed under the Vance Plan that all machine tools owned by the government which can be used for defense purposes should be retained by the government, in warehouse, on location, or in standby plants, for use in case of possible emergency.

This principle is being faithfully adhered to by our defense

*Mr. Tigges, immediate past president of the National Machine Tool Builders Association, gave this talk before the recent 53rd Annual Meeting of the Association.

authorities. The inventory of government-owned machine tools—and there are some 450,000 of them—to determine which should be retained and which should be disposed of, is well under way. It has been conducted, as you know, with the assistance of machine tool builders and machine tool users who have the requisite degree of technical knowledge . . .

Under the Vance Plan, the government was supposed to take steps to purchase certain critical machines required for specific defense production purposes in a quantity far in excess of normal commercial demand.

These are the machine tools currently termed, in our discussions with Washington, "elephant machines."

The use of the term "elephant" has given rise to the assumption that the problem, in connection with these machines, was that they were so big. As a matter of fact, that is not the case. Many of them **are** big machines—but the problem is not one of bigness, the problem is one of long lead time. In short, it takes a good many months from the time a company starts to build one of these machines until it can be delivered.

This makes the term "elephant machine" still more appropriate. The time of gestation of the elephant is about 19 months—which is just about the time it takes to build some of these elephant machines.

If the United States were attacked tomorrow, where would we be with respect to machines of this type?

Our most critical defense needs could not be met, because we would be from 12 to 19 months behind-hand.

The expense to the government is not large, but the risk involved in delay is incredible . . .

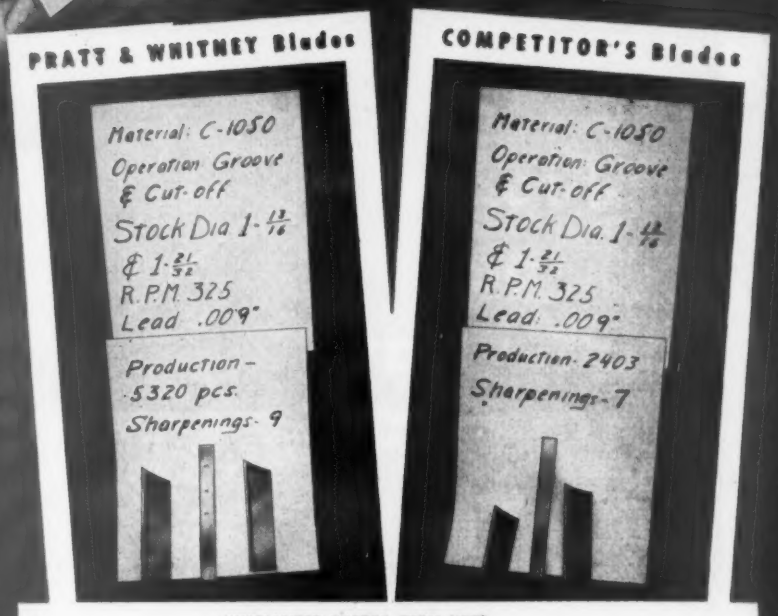
The next problem I want to discuss—in the light of the possibility that the United States might be attacked tomorrow—is what kind of organization there would be in Washington, capable of implementing machine tool procurement, allocating the machine tool reserve, etc., in line with the needs of the emergency.

Most of us here lived through two debacles, in situations of this sort. We saw Washington fall flat on its face, in this matter, in

. . . *Continued on page 12*

HERE'S PROOF OF THE SUPERIORITY OF

PRATT & WHITNEY T-CUT BLADES



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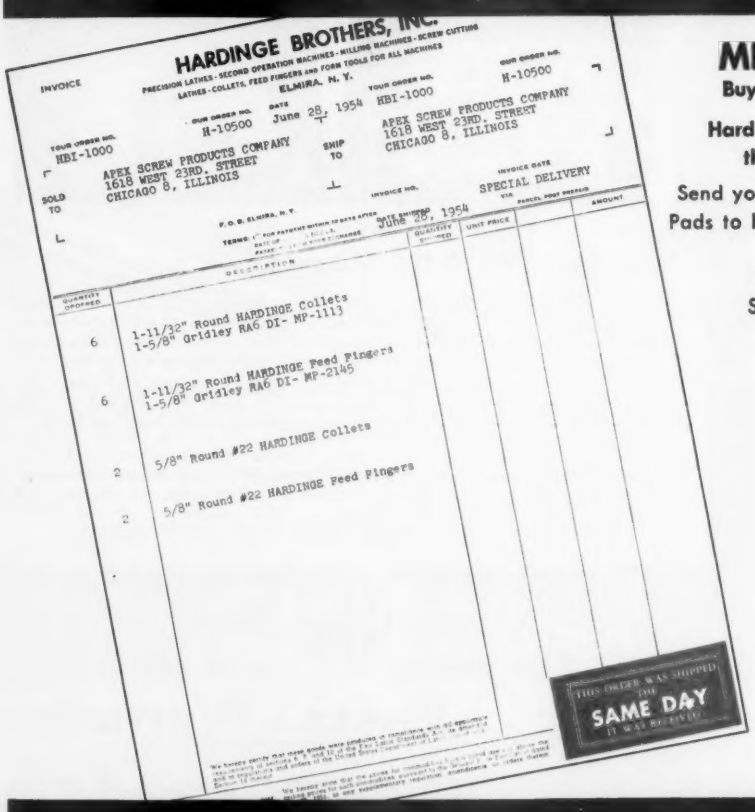
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PARCEL POST PREPAID
QUANTITY ORDERED
QUANTITY SHIPPED
DESCRIPTION
UNIT PRICE
AMOUNT
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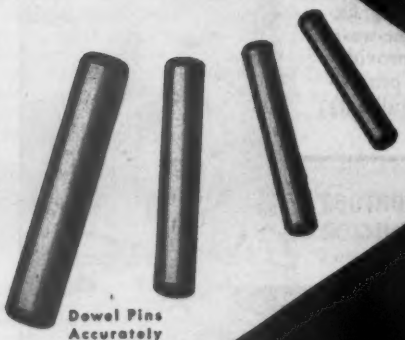

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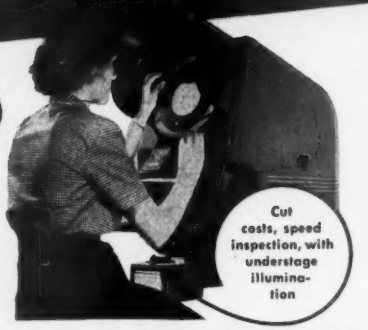

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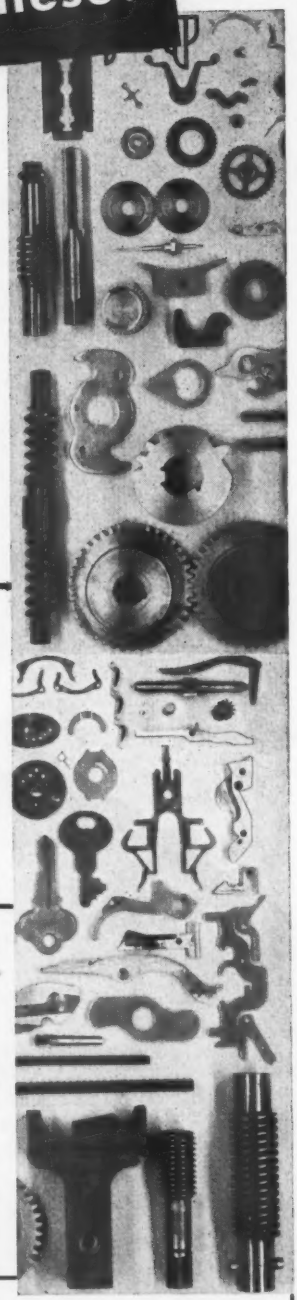

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Quality Control

INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 12

. . . Month's Talk, from page 9

World War II; and barely get up off its knees in the Korean emergency.

Never again will there be time enough to wait around and argue, and let months pass, until people in authority who do not understand machine tools and their functions are replaced by people who have practical knowledge of the situation. It doesn't take long for a bomb to drop.

Are we going to have in Washington, next time, an organization that can take over, with respect to machine tool defense requirements, with intelligence and dispatch?

Such an organization is presumed to be in making today within the framework of the Department of Commerce. But complacency may lull us into stagnation . . .

Now let us consider, from the standpoint of possible military attack on our country, the relationship between our domestic and foreign markets and machine tool building capacity.

All of you know what has been happening to our foreign sales, as the result of high tariffs, special import taxes, low wage rates, artificial restrictions, difficulties in getting dollars, nationalistic subsidies, and aid given to foreign competition by our own E. C. A. and its successor agencies, M. S. A. and the Foreign Operations Administration. Our percentage of sales to export markets has been reduced to a very sad percentage of our total sales.

What are we going to do about this? Set up affiliated companies in foreign countries, so we can manufacture under their low wage rates and thereby compete on price, which we can't possibly do on an export basis?

This is a tempting solution. Some companies are doing it and it is quite proper for them to do so. I am not criticizing them. But let's consider it from the standpoint of national defense. Do we want to transfer American machine tool know-how and capacity to a part of the world which Russia might be able to overrun within twenty-four hours? I think there is a better course of action.

The constructive solution to the dilemma of foreign sales would be for the State Depart-

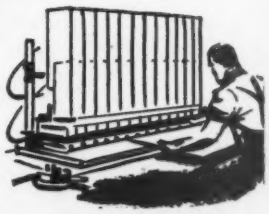
. . . Continued on page 16

ANNOUNCING

A NEW LOW COST Impact AIR HAMMER

CUTS COSTS AMAZINGLY in

- ASSEMBLING
- BLANKING
- CRIMPING
- EMBOSSING
- COINING
- CUTTING
- FORMING
- PEENING
- FORGING
- PUNCHING
- RIVETING
- MARKING



Most jobs done on expensive, heavy presses can *now* be done faster and cheaper by the light low-priced Mead Air Hammer using the new adjustable, spring*less* "Bullet Velocity" MEAD AIR TRIP! It delivers blows equivalent to 7½ tons down to as little as a few ounces—at several blows per second, if desired!

Enjoy the *competitive benefits* of really low cost production with this durable, powerful, improved Impact Air Hammer—another triumph by MEAD—pathfinder in air power automation. Put our "how-to-do-it" experience to work for you now. Ask the Mead Man today.

MEAD AUTOMATION

Impact Hammer combines readily, inexpensively with Mead pneumatic timers, work-feeders to form money-saving semi-automatic machines. Reciprocating base available to feed small parts under hammer and eject them automatically. The **MEADMAN** can show you how to save—using these and *other* Mead air-operated devices!

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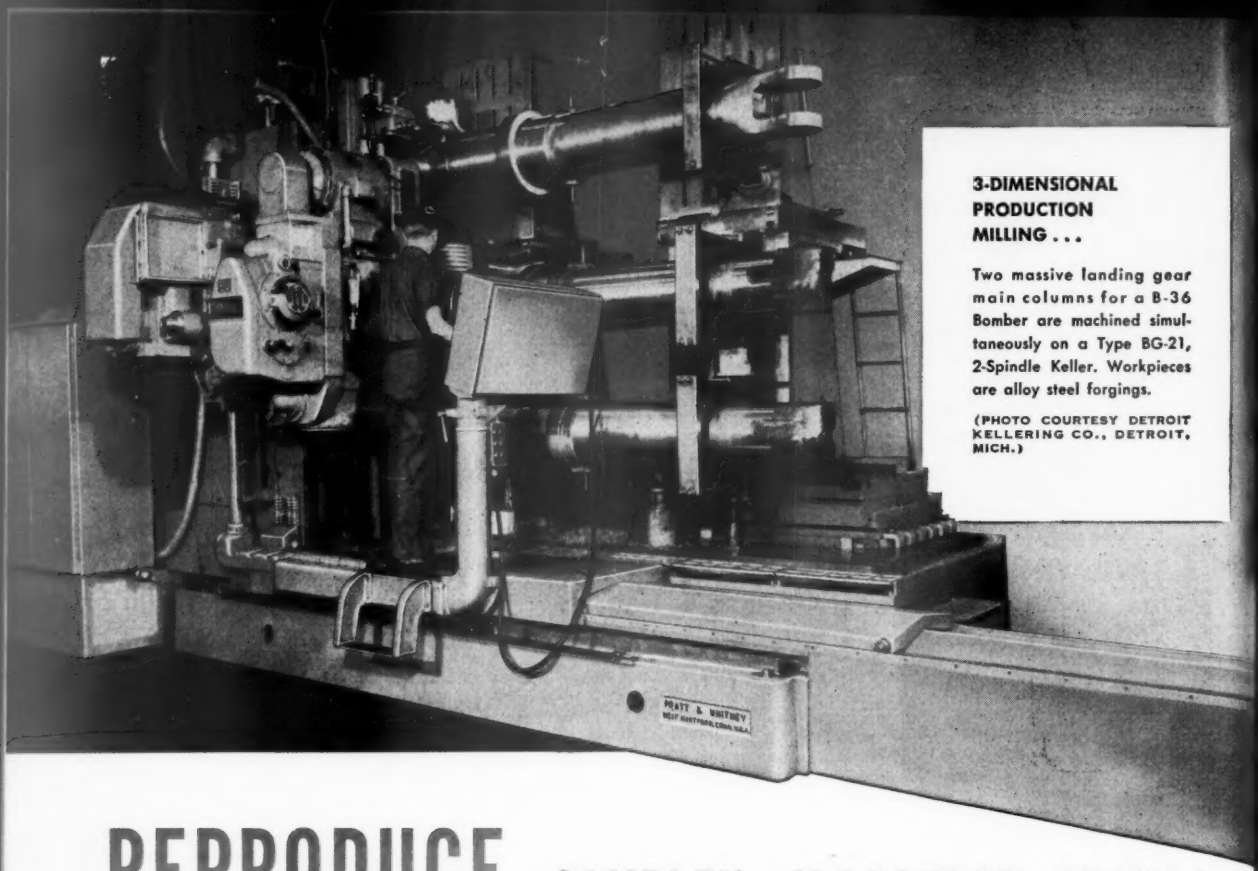
Pathfinder in AIR POWER AUTOMATION



3-DIMENSIONAL PRODUCTION MILLING . . .

Two massive landing gear main columns for a B-36 Bomber are machined simultaneously on a Type BG-21, 2-Spindle Keller. Workpieces are alloy steel forgings.

(PHOTO COURTESY DETROIT KELLERING CO., DETROIT, MICH.)

REPRODUCE COMPLEX, IRREGULAR SHAPES

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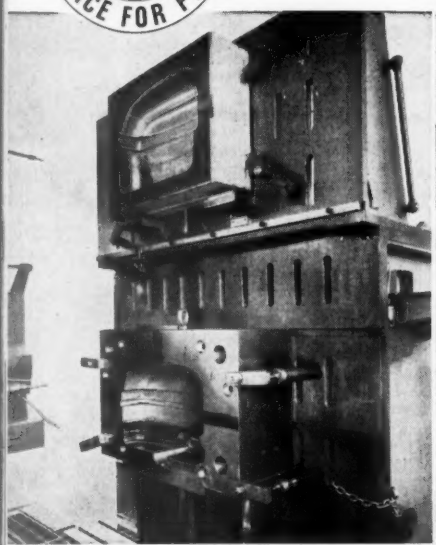
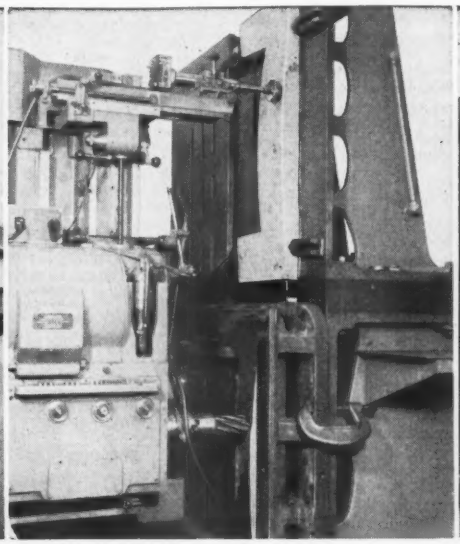


DIE CASTING DIE . . .

to produce metal shrouds for 25 hp outboard motors. Cavity was deep, intricate, and involved heavy metal removal. Cavity was completely Kellered in only 219 hours on a BG-21 Keller.

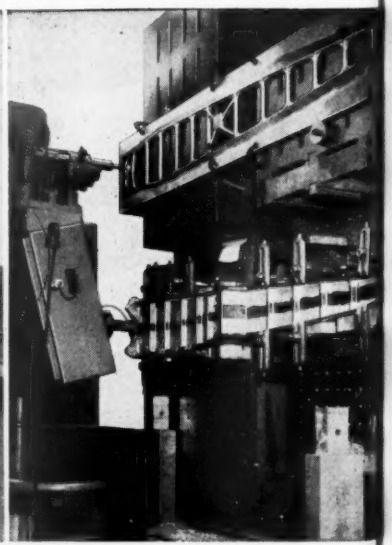
(PHOTO COURTESY ATOLS TOOL AND MOLD CORPORATION, CHICAGO, ILLINOIS)



DRAW DIE . . .

for a motor truck cab door, approximately 48" x 70". The complete job was produced quickly and economically on a Pratt & Whitney Type BG-21 Keller Machine.

(PHOTO COURTESY BUFFALO TOOL & DIE MFG. CO., BUFFALO, N.Y.)



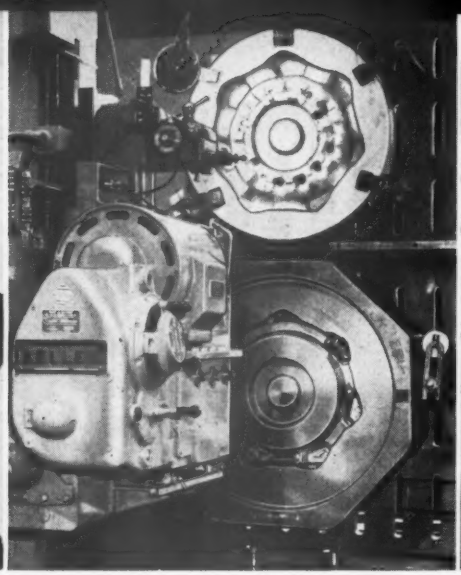
PROFILE MILLING . . .

an aluminum aircraft wing spar is fast and easy with "Kellering." The only template usually required for this type of work is a simple, 2-dimensional template.

BODY FORMING DIE . . .

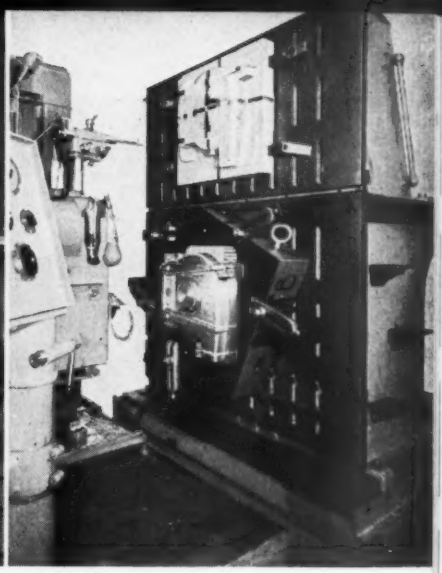
machined by full 3-dimensional tracer-controlled milling from an intricate plaster model. The finished die will be used to form a complete section for the famous Fisher Bodies.

(PHOTO COURTESY SONITH PATTERN WORKS, INDIANAPOLIS, IND.)



FORGING DIE . . .

Using a cement master cast from a wooden pattern, the Keller BG-21 duplicates the complex cavity in an aircraft engine forging die. "Kellering" accuracy on this type of work greatly reduces hand finishing cost.



IMPRESSION DIE . . .

18" x 24" x 4" to produce covers for an 18" rotary lawn mower (trade name "Lawn Boy"). Working from a plaster model, a Type BG-21 Keller Machine does the job rapidly, accurately.

(PHOTO COURTESY JOHNSON MOTORS DIV., OUTBOARD, MARINE & MFG. CO., WAUKEGAN, ILL.)

with PRATT & WHITNEY KELLER TYPE BG-21 Automatic Tracer-Controlled Milling MACHINES

OBTAINABLE IN CAPACITIES FROM: 4 FT. HORIZONTAL X 2½ FT. VERTICAL . . . UP TO 10 FT. HORIZONTAL X 4 FT. VERTICAL.

P&W KELLER Machines are powerful, horizontal spindle milling machines with electric tracer control. They reproduce the shape of any 2-dimensional template or 3-dimensional model accurately and economically; total machining time is much less than that required by other methods. Complicated shapes are duplicated as easily and efficiently as simple ones. The initial job is done more economically, and additional duplicates are produced at a fraction of the usual cost and time.

Keller Machines are designed and built *specifically* for tracer-controlled milling . . . not just "adapted" . . . and can take on a wide variety of jobs without requiring major adaptation by costly attachments. They are rugged machines that will operate dependably and accurately year after year without expensive maintenance.

IN ADDITION TO THE NEW TYPE BG-21, LARGER AND SMALLER SIZES OF KELLER MACHINES CAN BE FURNISHED.

WRITE NOW FOR COMPLETE INFORMATION

See how P&W Keller Machines can help reduce machining time and costs and increase your profits. Fill in the attached coupon and mail for your free copy of Circular No. 565 that completely describes the versatile new Type BG-21 Keller.

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CIRCLE INFORM-A-GRAM KEY NO. 16

. . . Month's Talk, from page 12

ment to prevail upon various foreign governments to relax nationalistic policies, eliminate special taxes and restrictive regulations, and permit American machine tools to enter foreign countries on an openly competitive basis such as prevailed before World War II . . .

Now let's come back home. Not just to Washington, but to our own plants, to the cities where you and I live and do business. And again remember I am talking about what might happen if we were attacked tomorrow.

I would like to ask you what security measures you have taken with respect to your own plant and your own community.

Of course nothing can be done about a direct hit, but war experience shows that a large share of bomb damage is on the periphery of the hit, involving fire risk, blowing out of windows, cutting of power lines, etc. . . .

It would seem only common sense, therefore, to set up in a plant a committee who could immediately assemble, at the call of a signal, and take certain pre-arranged steps.

I might also suggest that a company contemplating a new expansion may easily make provision for a bomb shelter, for a vault, for standby lighting; all of us can easily arrange for microfilming of our drawings. In short, let's assume our own reasonable share of prevention of disaster by enemy attack.

Now — still speaking from the standpoint of preparedness for possible attack, right here at home, by a foreign power — let's shift from the machine tool industry to our customers — to the metalworking plants of the United States.

These are the plants in which machine tool obsolescence is high today, the plants which are in urgent need of replacement programs, the plants that represent the immediate great market for our industry. What would happen in event of attack?

Within 24 hours after the first bombing, government orders for machine tools for immediate defense needs would swamp the machine tool industry, and it would be impossible for metalworking plants with old machines to obtain new machines to replace them. The country would enter the emergency with its

. . . Continued on page 21

SUPERFINISH BORES REDUCE TOOL WEAR
KNURLED HEADS PROVIDE GOOD GRIP
UNIVERSAL DRILL BUSHINGS
industry's standard of quality and service
100% CONCENTRICITY AND HARDNESS TESTS INSURE ACCURACY
BLENDED RADIUS HELPS PREVENT TOOL HANG-UP
UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH MICHIGAN
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Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Vastly increased production facilities assure immediate deliveries. Write to the office nearest you, Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

Universal products include: Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, and Universal Index Plungers. Write for catalog.

189

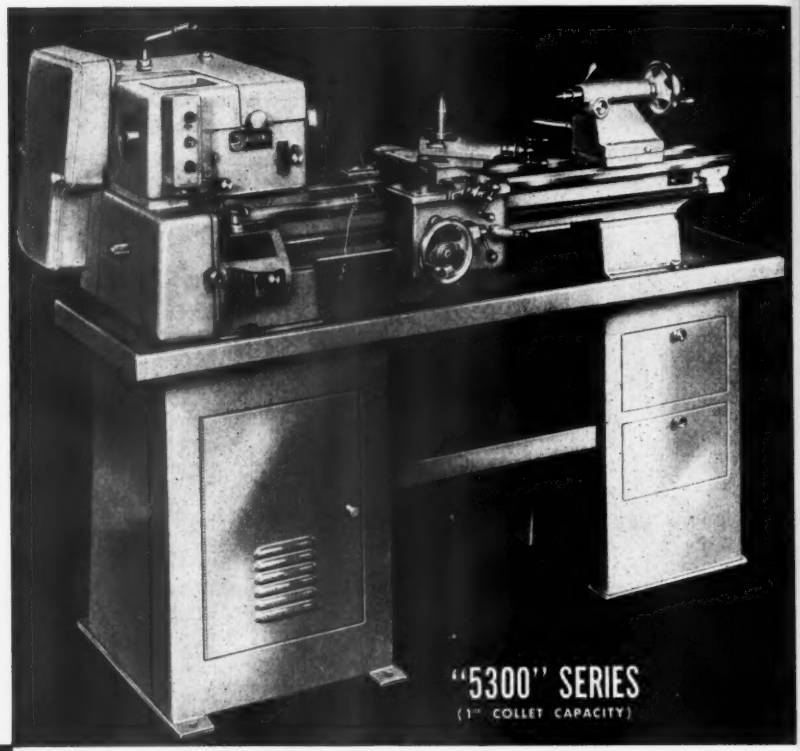
UNIVERSAL ENGINEERING COMPANY

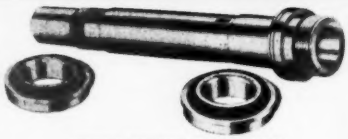
FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 17

MASSIVE NEW 12" CLAUSING LATHE

with Capacity + Accuracy + Economy +



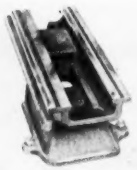


"ZERO-PRECISION" BEARINGS
Precision ground, forged steel spindle turns on widely spaced heavy-duty Timken "Zero-Precision" tapered roller bearings — bearing run-out tolerance is .00015.

QUICK CHANGE MECHANISM
Provides instant selection of 48 threads or feeds. ½" wide steel gears. Ground shafts turn on ball bearings. Plunger-type selector control.

CLUTCH AND BRAKE EQUIPPED COUNTERSHAFT
Friction clutch-brake permits instant starts and stops of spindle without stopping motor. Belts are fully guarded.

LARGE TAILSTOCK
Heavy-duty tailstock has No. 3 MT ram with tang socket. Swing-type wrench, permanently attached, controls bed lock.



PRECISION GROUND BED
Massive, semi-steel bed is 7⅞" wide, 5⅛" deep — thickly ribbed and braced. Vee-ways, flat ways and undersides are ground. Built-in screw-type leveling jacks.

Featuring "ZERO-PRECISION" Timken tapered roller bearings and exclusive clutch and brake countershaft

For production capacity, accuracy and profit potential, the brilliant new CLAUSING 5300 gives you more *Plus Value* features than have ever before been available in a 1" collet capacity lathe . . . at or near its price!

CAPACITY PLUS! 12" swing + 1⅜" hole through 16" long spindle + 2¼", 8-thread spindle nose + 1" collet capacity + heavy duty No. 3 MT tailstock with tang socket + ⅞" diameter lead screw + 12 speeds, 29 to 1300 RPM + 9" cross slide travel + 2¾" tool post slide travel + up to 48" between centers = Bigger Tool and Job Capacity . . . Wider Work Range!

ACCURACY PLUS! New heavy-duty headstock and tailstock . . . massive bed and carriage . . . for maximum rigidity and stamina + headstock diamond bored for husky Timken "Zero-Precision" tapered roller bearings, the most accurate used in any lathe + forged steel, precision ground spindle with hardened nose + headstock, carriage and tailstock hand fitted to precision ground Vee and flat ways of bed = Greater precision . . . Closer tolerances!

ECONOMY PLUS! Built-in countershaft with friction clutch and brake permits instant starts and stops of spindle without stopping motor + oil flinger spindle bearing lubrication + long wearing steel cable B-section V-belt drive + automatic apron with splash lubrication + instant selection of 48 threads or feeds = Savings in Time . . . Increased Production . . . Longer Life!

New Pedestal Base and Pedestal Cabinets! New pedestal bases and pedestal cabinets are 3/16" steel plate, welded and braced with thick box-type channeling . . . rigid foundations for accurate lathe work. Cabinet, illustrated above, has drawers in tailstock pedestal . . . base has plain tailstock pedestal. Both have shelf between. Be sure to see the new Clausing 5300 at your Atlas-Clausing dealer's. Feature by feature comparison will prove it's the Biggest PLUS Value in Lathe History!

Prices start at $715.00 F.O.B. Factory ILLUSTRATED literature on request.

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Atlas CLAUSING PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY KALAMAZOO, MICHIGAN U.S.A.

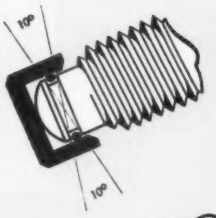
CIRCLE INFORM-A-GRAM KEY NO. 18

Northwestern's New

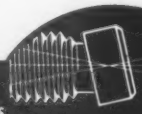
TOGGLE-SHOE CLAMPS

PATENT APPLIED FOR

SIZES—1/4-20 to 5/8-11
LENGTHS—1" up to 5 1/4"



10° ADJUSTMENT *in all directions*

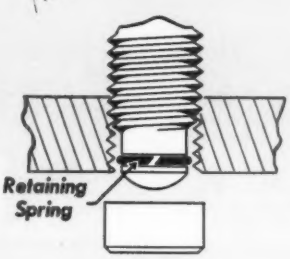


Retaining spring holds shoe in place yet allows a full 10° adjustment in all directions.

Dealers in most principal cities carry a complete stock of all Northwestern Tools

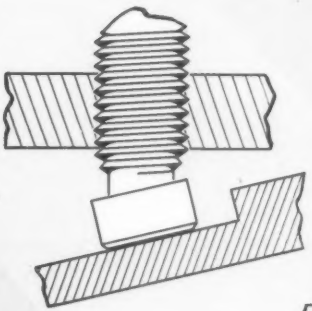
●

Write for *FREE TRACING TEMPLATE* of TOGGLE ASSEMBLIES IN ALL SIZES FULL SCALE

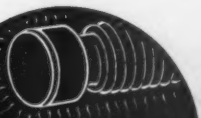


NO INTERFERENCE
Shoe only 1/16 larger than bolt

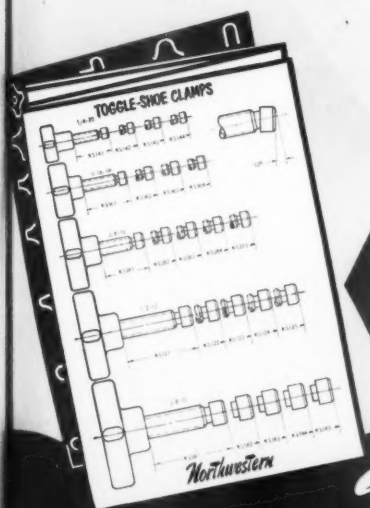
Short shoe design requires a minimum distance between fixture and the work.



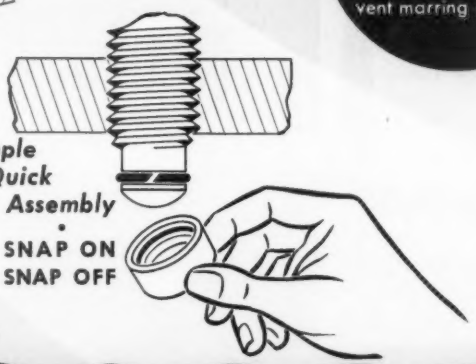
HEAT TREATED *for max. toughness*



Screw is heat treated for long life—shoe is heat treated to prevent marring of work.



Free TRACING TEMPLATE 286 ITEMS *full Scale*

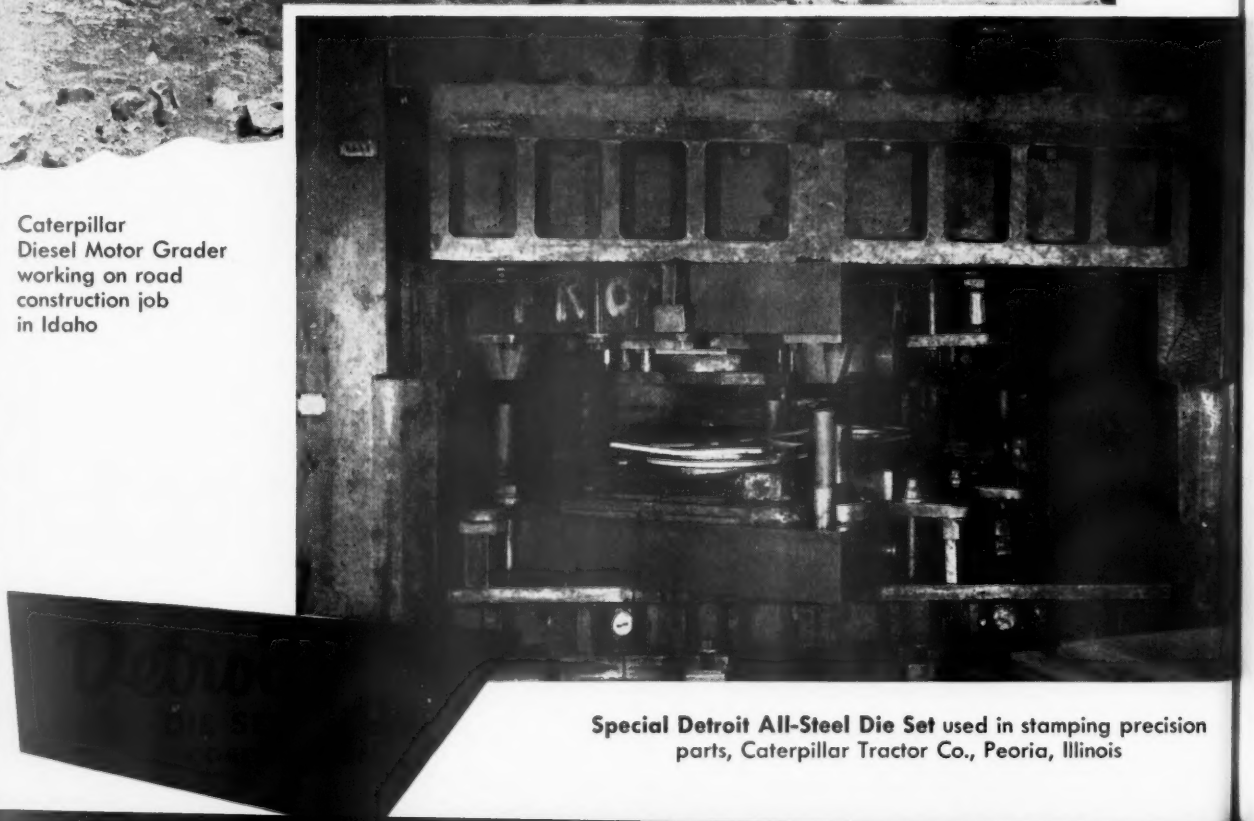


Simple Quick Assembly
•
SNAP ON
SNAP OFF

116 HOLLIER AVE. **Northwestern** DAYTON 3, OHIO

precision-built **RUGGEDNESS**

Caterpillar
Diesel Motor Grader
working on road
construction job
in Idaho



Special Detroit All-Steel Die Set used in stamping precision parts, Caterpillar Tractor Co., Peoria, Illinois

. . . Month's Talk, from page 16

metalworking plants only partly geared up to potential capacity.

Well—who is going to persuade the metalworking plants of America to do that job of modernization? Is government going to do it?

No — government is not going to do it, and the owners of these metalworking plants are not going to replace old machines unless we in the machine tool industry go out and sell them on its necessity.

And we won't be able to sell them on grounds of national defense, as logical as that approach might be. You know from practical experience we can sell them only on the basis of self interest, only on the basis of profit advantage to the individual company.

In short, we must make the replacement of old machines by new ones so attractive to the metalworking industries of the country that they will modernize their plants to the degree required for the continuing protection of the United States.

Another essential in preparedness against attack is a sound domestic economy. Our economy is based upon the competitive system, which is the foundation of our own industry. We are geared up in this country to a psychology of perpetual improvement. We expect progress every year. A continuous advancement in the standard of living is essential to the healthy operation of our economy . . .

Let's translate this into terms of economic stability. The more you can produce for a dollar, the more the dollar is worth. That's the way to defeat inflation.

So here is another angle in the relationship between machine tools and national defense. But here again we are not going to persuade plants to modernize on the ground that by doing so they will help to defeat inflation. The only way to get action is to prove that replacement means lower costs and larger net profits.

So the key to this whole situation is selling. Our job is that of persuading the nation's metalworking plants to take advantage of today's three-fold opportunity to cut costs in a competitive market. There are open to them three modernization incentives:

The first is the change in the depreciation provisions of the In-

. . . Continued on page 28

GORTON

TRACER CONTROL at Its Best

Infinitely variable speeds and feeds . . . no lead screws or gear boxes to limit flexibility

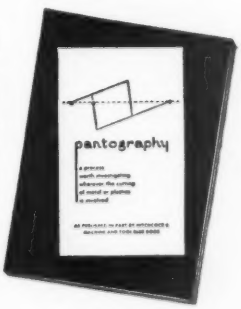
Standard P3-2 Pantograph with special indexing knee fixture and automatic tooling.

Photo shows a standard P3-2 profiling ports in an aircraft part, a large aluminum-alloy casting. The sides of each port are parallel; one end has a true radius, the other end is parabolic. A combination of other methods would do the cutting in hours, but the P3-2, with an automatic cutting cycle, finishes each port in 2.3 minutes.

Improve Production and Lower Costs

Gorton tracer-controlled equipment does efficient profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving and many other standard or special operations. You can expect high accuracy and high surface finish, whether your work involves metals or plastics in flat, uniformly curved, cylindrical or irregular shapes.

Enlarged templates, masters or patterns, all quickly and easily made, give Gorton Pantographs advantages of increased accuracy through reduction ratios. Work pieces range in size from the diameter of a dime to 10 feet. Cutting cycle is accomplished manually or automatically.



Fill out and mail the coupon for your copies of the Gorton catalog and the informative booklet, "Pantography."

GEORGE GORTON MACHINE CO.

Please send at once complete information about the Gorton line contained in Bulletin: 1201

Firm .....

Name .....

Title .....

Address .....

City, State .....

1201 Racine St., Racine, Wis., U.S.A. A 7786-3/3

CIRCLE INFORM-A-GRAM KEY NO. 21

It's built to HALVE

CIRCLE INFORM-A-GRAM KEY NO. 22

drilling costs ...

---with more mass production features!

---with more cost reduction features!

ALREADY proved in use, the new Dumore Automatic Drill Unit is engineered to *earn* more and *save* more on the production line. It's designed for simple mounting in any position or combination . . . and to step up drilling operations. But let the features speak for themselves!

★ Easy mounting in any position.

★ Built-in controls for manual, semi-automatic and automatic operation.

★ Positive, no-slip spindle drive with ten selective spindle speeds.

★ Economical low-air-volume operation.

★ Air and hydraulic systems completely separate — easy maintenance.

★ Keeps tooling simple — tooling costs low.

★ Individual unit control provided in multiple unit setups — for rapid tool changes or job conversions.

★ When mounted on a standard drill press column, the unit becomes a self-contained, automatic drilling and tapping machine.

★ Full 3″ stroke with depth adjustment to within ± .001″.

★ Built-in auxiliary circuits for automatic activation of transfer equipment, indexing fixtures, other drill units for sequence operation in multiple setups.

PLUS these special operating features obtainable with Dumore accessories:

★ *Dumore Repeat Cycle Timer* — for *automatic stage drilling and tapping* of deep holes — providing automatic chip clearance, better holes, less drill and tap breakage.

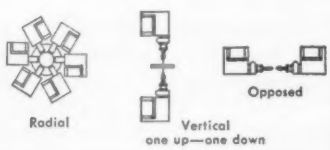
★ *Dumore Hydraulic Control* (optional) . . . for quick insertion or removal. Provides rapid approach, controlled feeds through work.

★ A variety of mounting accessories is available for adapting to existing or specially designed equipment.

Specifications: Dumore Automatic Drill Unit
WIDTH: approx. 9½″ • HEIGHT: approx. 15″ • LENGTH OVERALL: (incl. chuck) 24″ • WEIGHT: (incl. motor) approx. 88 lbs. • FEEDS: Adjustable from 25 to 400 lbs. thrust. • RAPID APPROACH RATE: Adjustable up to 600-in. per min. (Distance adjustable from 0″ to full stroke.) • AVAILABLE MOTORS: ½ to ⅓ HP; constant speed, continuous duty.

Get all the details! Send for descriptive bulletin today!

Mount the Dumore Automatic Drill Units to fit your needs



DUMORE
PRECISION TOOLS
Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 22

WHEN THREADS HAVE TO BE

Right

...Your gages do too!

Detroit thread plug and thread ring gages have long been noted for their high degree of accuracy and long life.

Now, in addition to accuracy and quality, Detroit Tap and Tool can make prompt delivery on Standard American National thread gages as well as on gages for Unified threads, American Standard pipe threads, Aeronautical pipe threads or Dryseal pipe threads.

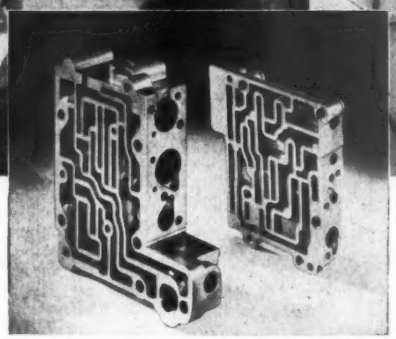
Many special size thread ring and thread plug gages are also carried in stock for immediate shipment.

See your local Detroit Tap and Tool representative today. Ask for our complete Catalog-Price List (SG-53) covering standard thread gages.

DETROIT TAP & TOOL CO.

8615 E. EIGHT MILE RD. BASELINE, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 24



Holes on extremely close centers vary in diameter from 1/16" to 13/16". The valve body has 33; the cover, 18.

"—BUT OUR PRODUCTION RUN IS LIMITED."

"SO WAS THE RUN ON THIS AUTOMATIC TRANSMISSION PART, BUT". . . .

HERE'S HOW ZAGAR TOOLING SAVED MONEY HAND OVER FIST

This aluminum die casting is processed in its entirety by Zagar planning, except for milling two faces. Two lines of Zagar standardized self-clamping drill jigs ream, tap and drill both valve body and cover. With 24 heads and 24 fixtures, Zagar performs work on 51 holes on close centers. Step tools take care of reaming and burnishing. The fixtures were designed to compensate for slight inaccuracies in the die casting. Thus has Zagar engineering solved an acute problem of limited production without the purchase of costly special machines.

Ask on your letterhead for Bulletin "T-1."

ZAGAR TOOL, INC.

24000 LAKELAND BOULEVARD • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 25

13 Key Moore Tools help put the PRECISION in Harig Dies

KARL HARIG

"When owner-management invests its money in machinery," says Karl Harig, founder and president of Harig Manufacturing Corporation, "it does so only after a thorough analysis and careful selection of available equipment." So it's significant that Harig, one of America's foremost producers of carbide, lamination, progressive, stamping and other types of precision dies, employs 13 Moore precision-built machine tools for many of its most critical toolroom operations.

A trip through Harig's modern Chicago plant reveals:

3 MOORE JIG BORERS, for accurate locating and boring of holes in a fraction of the time required by other means;

6 MOORE JIG GRINDERS, for relocating and grinding of holes and contours—within tenths—after hardening;

3 MOORE PANTO-CRUSH WHEEL DRESSERS, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

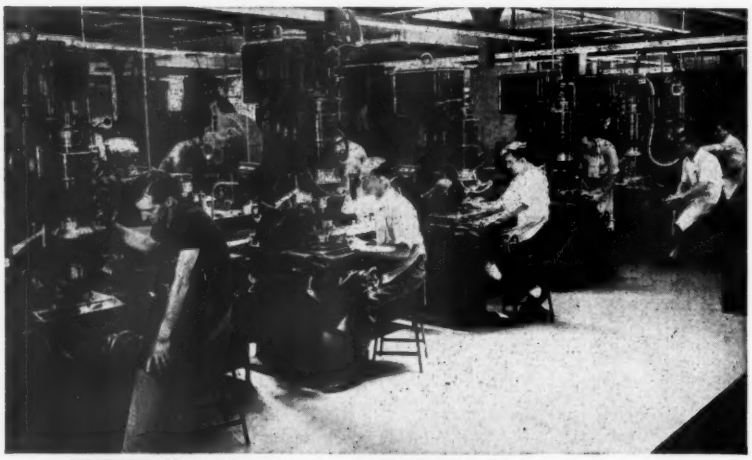
1 MOORE DIE FLIPPER, for "mechanized" die tryouts and assembly.

The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

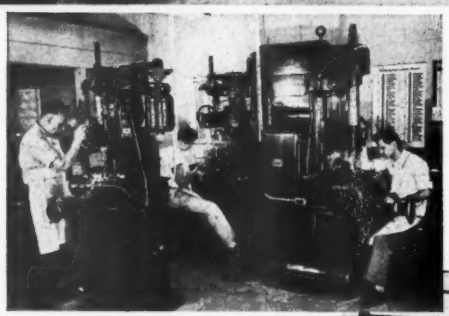
Why not discover how Moore tools can bring more speed and greater accuracy to *your* toolroom. Write today for our detailed literature.

Moore Special Tool Company, Inc.

726 Union Avenue, Bridgeport 7, Connecticut

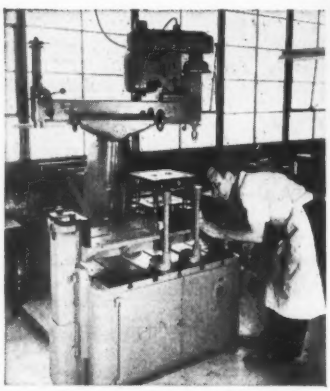


A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.



Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.



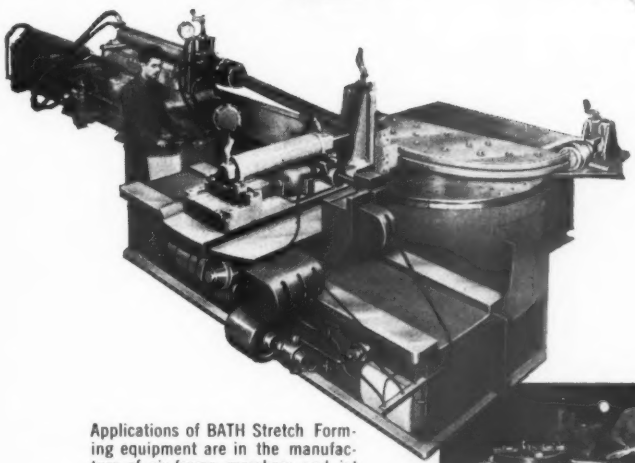
A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 26

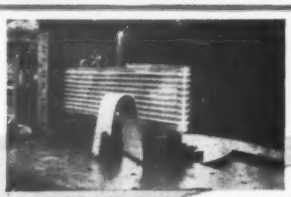
NEXT . . . THE THERMAL BARRIER



Applications of BATH Stretch Forming equipment are in the manufacture of air frame members and jet rings for the aircraft industry. VERSATILITY, PRECISION . . . AND SAVINGS . . . are offered only in the BATH process of forming.

Aeronautical scientists are up against the terrific heat problem in cracking the THERMAL BARRIER. Heat generated by friction at supersonic speeds not only weakens metal, but surrounds the pilot in a "St. Elmo's Fire". CYRIL BATH Stretch Forming Methods are playing an important roll in accurately forming the new alloy metals to meet tomorrow's problems today.

Complete literature is available on the CYRIL BATH Stretch, Radial Draw and Compression Forming methods. Send for YOUR copies . . . NOW.



THE CYRIL BATH COMPANY

32380 AURORA ROAD • SOLON, OHIO
(LOCATED IN THE GREATER CLEVELAND AREA)

MANUFACTURERS OF RADIAL DRAW FORMERS • DIES • TOOLS • PRESS BRAKES • TANGENT BENDING SEQUENCE PRESSES • PRESS TYPE BRAKES • SPECIAL MACHINES

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QUALITY...
Quality that delivers more cutting mileage. There's quality in the raw materials . . . in the design . . . in the craftsmanship . . . all of which are doubly assured by our rigid inspection.
These are drills for top production!

CHICAGO LATROBE

DOUBLE-CIRCLE DRILLS

SERVICE
You can rely on your CHICAGO-LATROBE DISTRIBUTOR for fast delivery and service . . . Consult him on your technical problems, too. Through his close relation with our factory, he can deliver what you need when you need it.
*GUN DRILL
CONTACT THE CHICAGO-LATROBE DISTRIBUTOR IN YOUR AREA. OVERNIGHT SERVICE ANYWHERE.

DOUBLE CIRCLE TOOLS

Chicago-Latrobe

422 W. ONTARIO STREET, CHICAGO 10

DRILLS • REAMERS • COUNTERSINKS • COUNTERBORES • CARBIDE TOOLS • SPECIAL TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 28

. . . Month's Talk, from page 21

ternal Revenue Code, plus a new Internal Revenue Department policy with respect to permitted write-off period . . .

What this means, for example, is that instead of writing off a machine in twenty years, a company may perhaps be able to write it off in sixteen years; and recover three-fourths of its cost at the end of the first eight years, as contrasted to one-half of the cost in the first ten years under the old method.

This gives us a real talking point with which to approach financial executives concerning machine tool purchases . . .

The second modernization incentive has to be with the accelerated rate of invention, design, and development which has been going on in our industry since the end of the Korean emergency. I don't have to go into details on this subject, because all of you know what you are doing along this line in your own companies. What this means, however, is that today, when we talk replacement, we have a real story to tell. We have very substantial savings to offer. The product is good. The question is one of taking it to market.

And here we come to the third incentive to modernization — the forthcoming Machine Tool Show to be held in Chicago in September, where the operating executive can see in operation, and compare, the various makes and types of machines that may be appropriate for his replacement requirements . . .

There we will have on display, under one roof, what it takes to help keep America's economy stable, to maintain the advance in the standard of living, and to keep our country properly prepared against an attack by a foreign power.

There is an old saying, "In time of peace, prepare for war." I think today's version of that proverb should be, "In time of peace, prepare **against** war."

We can prevent war, if we can make ourselves so strong that no one will venture to attack us . . .

For Your Future

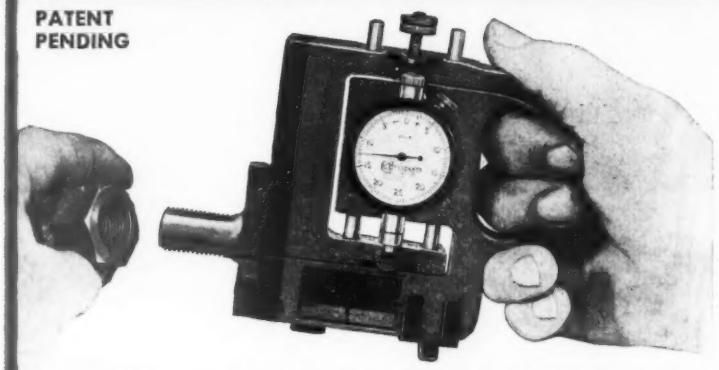
BUY U. S. SAVINGS BONDS

Newer Than NEW!... Versa-Dial

Introducing STANDARD'S new truly all purpose dial unit . . . a simple, easily operated, direct reading instrument, with a potential for nearly all types of INTERNAL and EXTERNAL applications.

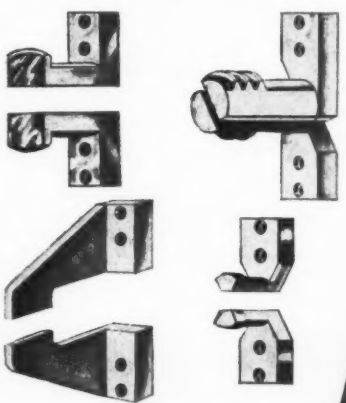
Interchangeable segments permit checking of THREADS for over-all fit, pitch diameter, or lead. Gears for pitch diameter or tooth spacing; also GROOVES, shallow COUNTERBORES, narrow SHOULDERS, BLIND HOLES, etc. . . . an almost unlimited variety of work. The VERSA-DIAL can be converted from one type of job to another in moments.

PATENT PENDING

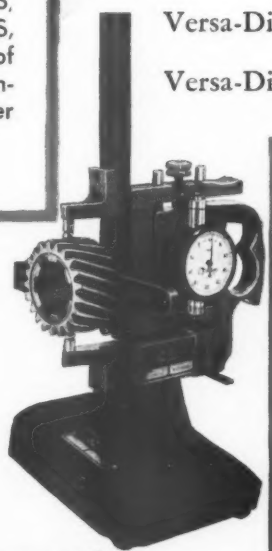


Versa-Dial **INTERNAL THREAD COMPARATOR**

Versa-Dial **HELICAL GEAR PD COMPARATOR**
mounted on bench stand



Interchangeable Segments



Versa-Dial **EXTERNAL THREAD COMPARATOR**

VERSA-DIAL FEATURES

- ★ **EXTREMELY VERSATILE;** good for almost any job
- ★ **EXCEPTIONALLY WIDE RANGE** up to 7" or more
- ★ **QUICK AND EASY TO SET-UP** for long or short runs
- ★ **RAPID LOADING;** easy to operate
- ★ **LONG LIFE;** minimum contact wear

Segments are secured in T-Slots at desired spacing . . . movable segment actuates dial indicator, giving direct reading of variations from basic size. Movement is straight; unusually smooth and precise . . . ideal for gaging.

STANDARD Gage Co., Inc.
Poughkeepsie, N.Y.

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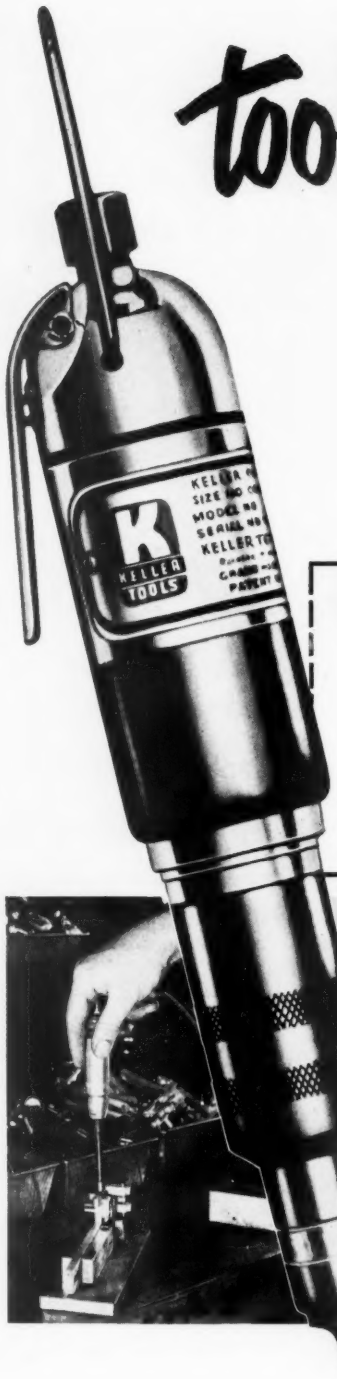
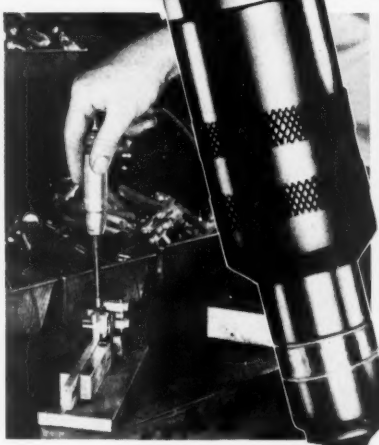
tool-up for production changes in *minutes* . . . with KELLER AIR TOOLS

Interchangeable parts for screw drivers and nut setters provide hundreds of combinations to button-up assemblies faster . . . easier



handles	motors	attachments
	in 3 sizes	Straight drive, positive or cushion clutches
Short	Reversible	Straight
Straight		45°
Offset	Non-Reversible	Right Angle

Plus a wide variety of finders, bits, and sockets . . . with magnetic, pneumatic, and mechanical pickup and holding devices.



Write for Bulletin 13 on Keller Screw Drivers & Nut Setters

KELLER
Pneumatic Tools
KELLER TOOL CO.

1313 Fulton Street
Grand Haven, Michigan

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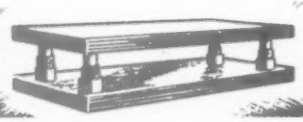
now LEMPCO

2-POST *BALL BEARING* DIE SETS

ARE PRICED DOLLAR-FOR-DOLLAR WITH

COMMERCIAL PLAIN BUSHING DIE SETS!

IMMEDIATE DELIVERY FROM STOCK.

LARGE & SPECIAL  LEMPCO BALL

BEARING DIE SETS *NOW* QUOTED AT

DRASTICALLY ***REDUCED PRICES!***

DELIVERY: Within 5 DAYS • • • SPECIALS, 10 DAYS.

It's true; now you can buy the die sets which are known to be the best, at REGULAR prices. Famous Lempco Anti-Friction Die Sets out-perform all other makes. Save you money, time and trouble.
Lempco's rapidly growing die set VOLUME makes this price reduction possible.

WRITE FOR LEMPCO'S BIG NEW (7th Edition) CATALOG AND LATEST PRICE LIST

NOW BUY THE BEST IN DIE SETS—FOR LESS

LEMPCO PRODUCTS, INC., BEDFORD, OHIO

LEMPCO INDUSTRIAL DIVISION

HYDRAULIC MARKING MACHINES by Parker

UNSURPASSED FOR EVERY PRODUCTION MARKING APPLICATION

AFFORD FASTER, BETTER, MORE ECONOMICAL MARKING OF ANY LEGEND . . . ON ANY MATERIAL . . . AND EVERY CONTOUR!

No. 650 PARKER MARKING MACHINE

Parker Marking Machines are unmatched for versatility—stamp lettering, trademarks, graduations, knurling in limitless varieties on flat, irregular or curved surfaces of different diameters. Each impression is clean and sharp—indelibly stamped to uniform depth—in far less time, to far greater precision than the finest hand marking.

PARKER CAN PRODUCE A TOOL TO SPECIFICATIONS FOR ANY MARKING MACHINE!

Interchangeable type holders . . . roll dies . . . flat dies . . . engraved knurls—whatever your requirements, Parker engineers and craftsmen can produce a marking tool to your specifications to fit any marking machine.

GET COMPLETE INFORMATION:
Send today for literature on the Parker 650 Marking Machine.

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

CIRCLE INFORM-A-GRAM KEY NO. 32

"Commendable Comments"

"Although it has been less than 12 years since the power of the atom was harnessed within a nuclear reactor, we have already made tremendous progress in research and development in connection with agriculture, chemistry, metallurgy, biology, medicine and other areas of science and industry. We are not yet at high noon of the atomic age — only at the first glimmer of its dawning."

—Lewis L. Strauss, Chairman, U. S. Atomic Energy Commission.

"Automation was not created overnight . . . It was the result of continual developments . . . Success will depend in large measure upon the ability to control down time . . . It is not too difficult to produce a Rube Goldberg design . . . but the machine designer who watches his details is the man who will create the automatic factory that works."

—From a paper by K. O. Tech, Chief Engineer, The Cress Co. before the Annual Meeting of The American Society of Mechanical Engineers.

"Demand for high-volume, low-cost production has forced manufacturing industries to consider automatic processes and to analyze their methods with automation in mind. Automation expenditures must pay for themselves."

—William R. Slattery, Ford Motor Co. Annual Meeting of The American Society of Mechanical Engineers.

"The city of the future is no longer being planned; it is being built. The suburban area is the answer to our needs."

—Steven P. J. Wood, President, Warner Electric Brake & Clutch Co. Editorial in the WARNER WORLD.

"Today, when we are living in a continuing challenge to our free society, the skills of our workers become even more important . . . . . What the individual apprentice does with the opportunities that come his way — is in part up to him . . . . To those with ambition, it should only be a challenge to further study and further achievement."

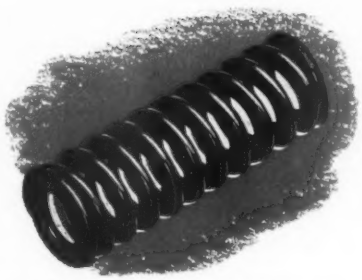
—An address by A. G. Beaubien, Bureau of Apprenticeship, U. S. Department of Labor at the Annual Completion of Apprenticeship Ceremony of Patternmakers in Cleveland.

We asked hundreds of tool and die makers...

"What's wrong with the die springs you now use?"

Their answers sparked DIECO's metallurgical and design research...led to a complete new line that

out-performs others up to 3 to 1

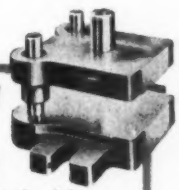


Working with leading spring specialists, Dieco engineers developed a complete new line of die springs which have licked the toughest spring problems.

Special steels were developed... special methods for treating them ...even special packaging methods to eliminate "growth" in transit.

Out of this field research and development came a line of more than 500 standard-size springs, in three distinct pressure classifications: Medium, Medium-High and High. For the first time, it became possible to "fit" the spring to the job at hand, to pick the precise pressure required for a given die action.

Now, satisfied users report that Dieco springs virtually eliminate downtime and wasted man hours due to die spring failure. If you have a tricky spring problem tying up your pressroom, call your local Dieco representative. He will be glad to help you pick the proper spring for the job. And to put an end to spring problems before they start... specify DIECO die sets and die springs.



Call your local DIECO office TODAY!

CLEVELAND	1400 Brookpark Rd., SHadyside 1-9000
PITTSBURGH	122 S. Sheridan Ave., EMerson 1-0440
DAYTON	Die Supply Sales Co., 311 Vermont Ave. MI 9691
BUFFALO	Die Supply Corp., 440 Terrace Blvd. Depew, N. Y. Regent 6767-8
ST. LOUIS	Scott Special Tools, Inc., 1252 N. Kingshighway, FOrest 3454
DETROIT	20201 Sherwood Avenue FOrrest 6-2480

Write for Catalog No. 6-A

BLISS SINCE 1857

DIECO

Industry's most complete line of die sets and die makers supplies

The DIE SUPPLY Company

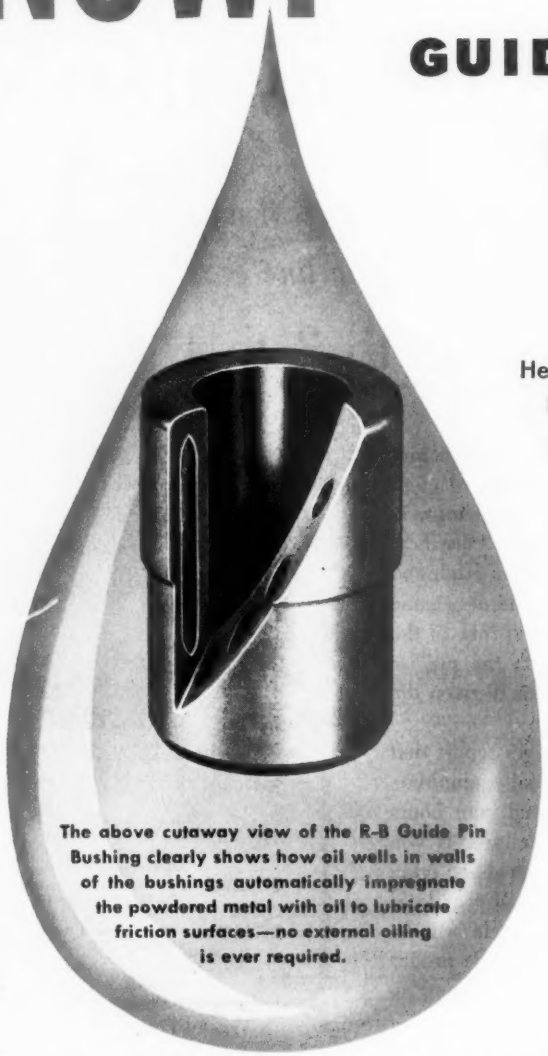
1400 Brookpark Road, Cleveland, Ohio
a subsidiary of E. W. BLISS COMPANY

DIE SETS • GUIDE PINS

BUSHINGS • SPRINGS • SOCKET HEAD SCREWS • 5001 ITEMS

CIRCLE INFORM-A-GRAM KEY NO. 33

NOW! Self-Oiling GUIDE PIN BUSHINGS OF POWDERED ALLOY STEEL



The above cutaway view of the R-B Guide Pin Bushing clearly shows how oil wells in walls of the bushings automatically impregnate the powdered metal with oil to lubricate friction surfaces—no external oiling is ever required.

Here's an entirely new concept in guide pin bushings—made of heat treated powdered alloy steel, each bushing has filled internal oil wells. Lubrication to friction surfaces is automatic and no external oiling is required throughout the long life of the bushings.

Wear characteristics of these bushings are comparable to that obtained with finest bronze bushings. In addition, this new R-B design greatly reduces guide pin wear and the possibility of seizing or galling. Self-oiling, less guide pin wear and longer life add up to minimum maintenance, reduced costs and maximum usage of press time.

4117

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 79 • 12635 BURT RD. • DETROIT 23, MICHIGAN

Please send me additional information.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
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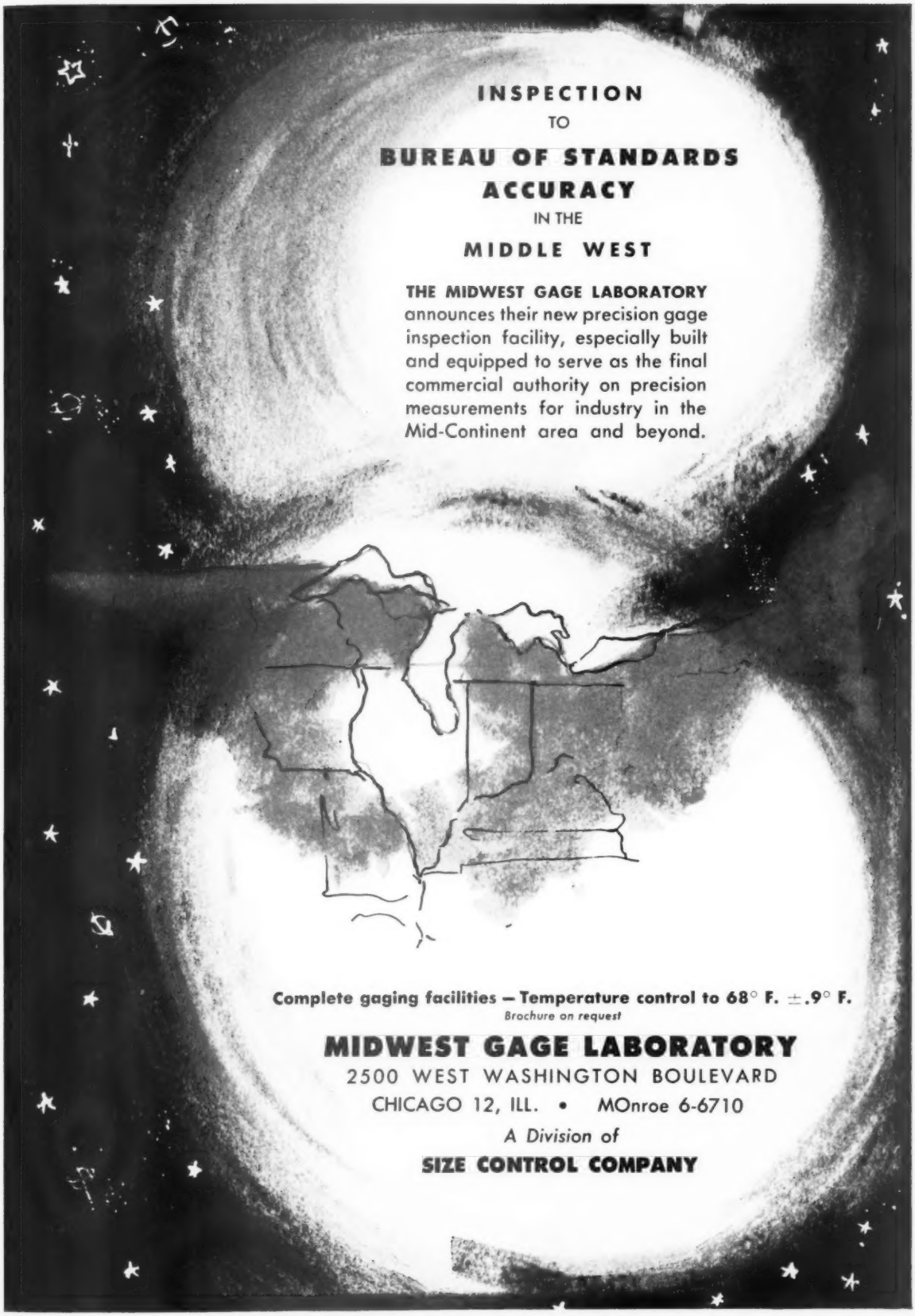
INSPECTION
TO
BUREAU OF STANDARDS
ACCURACY
IN THE
MIDDLE WEST
THE MIDWEST GAGE LABORATORY announces their new precision gage inspection facility, especially built and equipped to serve as the final commercial authority on precision measurements for industry in the Mid-Continent area and beyond.
Complete gaging facilities — Temperature control to 68° F. ±.9° F.
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MIDWEST GAGE LABORATORY
2500 WEST WASHINGTON BOULEVARD
CHICAGO 12, ILL. • MOnroe 6-6710
A Division of
SIZE CONTROL COMPANY

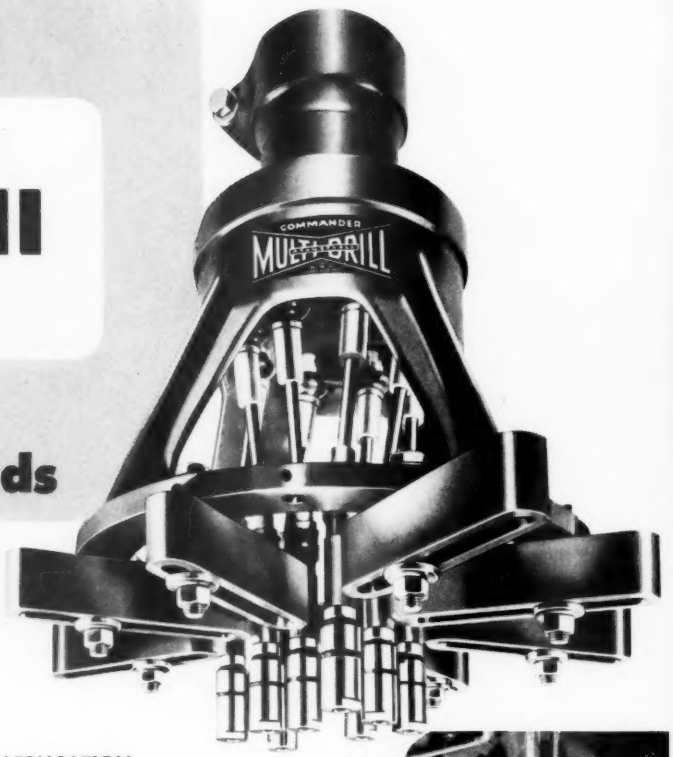
WHY

is the Commander

Multi-Drill

the leader among

multiple spindle drill heads



GREATER FLEXIBILITY . . . WIDER APPLICATION

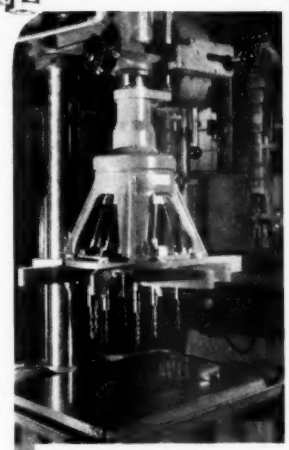
Universally adjustable MULTI-DRILLS—with their many special spindles, extensions, accessories and attachments—will do more drilling, tapping and reaming jobs . . . will handle a wider area with more precision and control—providing maximum tool utility and lowest all around costs.

BETTER PERFORMANCE . . . LONGER LIFE

MULTI-DRILLS are built for high production work . . . components—from the tough high strength aluminum alloy frame to special alloy heavy duty block-type universal joints are selected for strength and durability. Users don't have to "baby" the MULTI-DRILL . . . it's designed and built to do a man-size job.

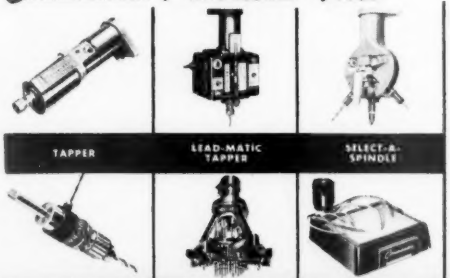
ASSISTANCE AND SERVICE FROM DRILLING SPECIALISTS

If you have a drilling or tapping problem—or merely want to cut your production time and costs, your nearby MULTI-DRILL Distributor will provide competent assistance, complete service and prompt delivery from stock.



MULTI-DRILLS are quickly and easily attached to any drill press—are ready to work in a matter of minutes!

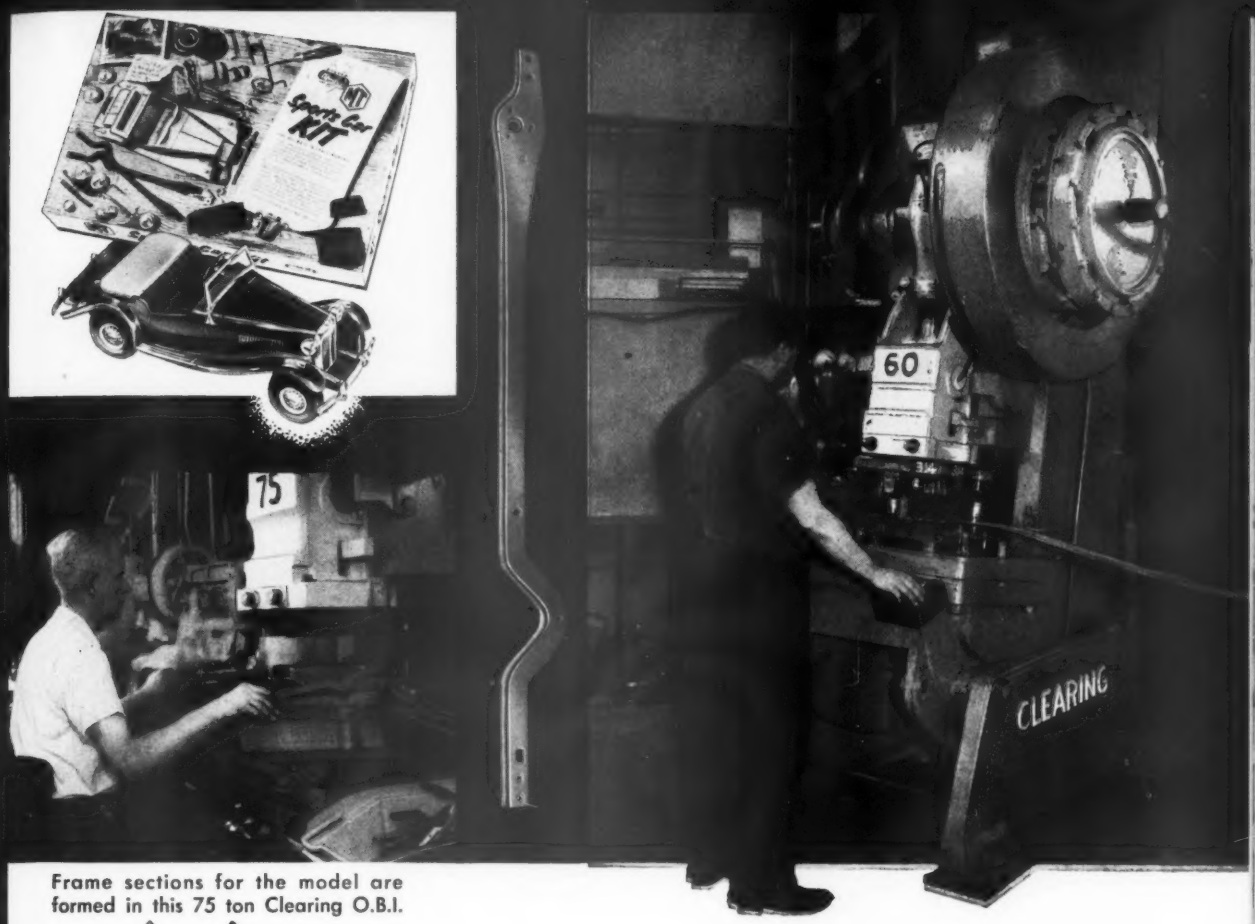
Commander Production Tools



Commander MANUFACTURING CO.

4228 W. KINZIE STREET • CHICAGO 24, ILLINOIS

The Commander catalog has complete information on MULTI-DRILLS and many other cost-cutting production tools. Write for it and the name of your nearby Commander Distributor today.



Frame sections for the model are formed in this 75 ton Clearing O.B.I.

Model TOYS

PRODUCTION LINE

Uses CLEARING O.B.I.'s

The MT sports car kit produced by the Doepke Mfg. Company is designed to make dad's eyes sparkle even more than Junior's. In this authentic scale model, parts are made of heavy gauge steel to simulate the larger components of full size cars.

Just as in large automobile plants, efficient mass production makes it possible to put out a product the public can afford to buy. That's why Clearing O.B.I.'s are a major factor in Doepke's manufacturing system.

If you want to make your production a model of efficiency, let a Clearing engineer discuss your plans with you. Call or write today.

THE WAY TO EFFICIENT MASS PRODUCTION

CMC

CLEARING PRESSES

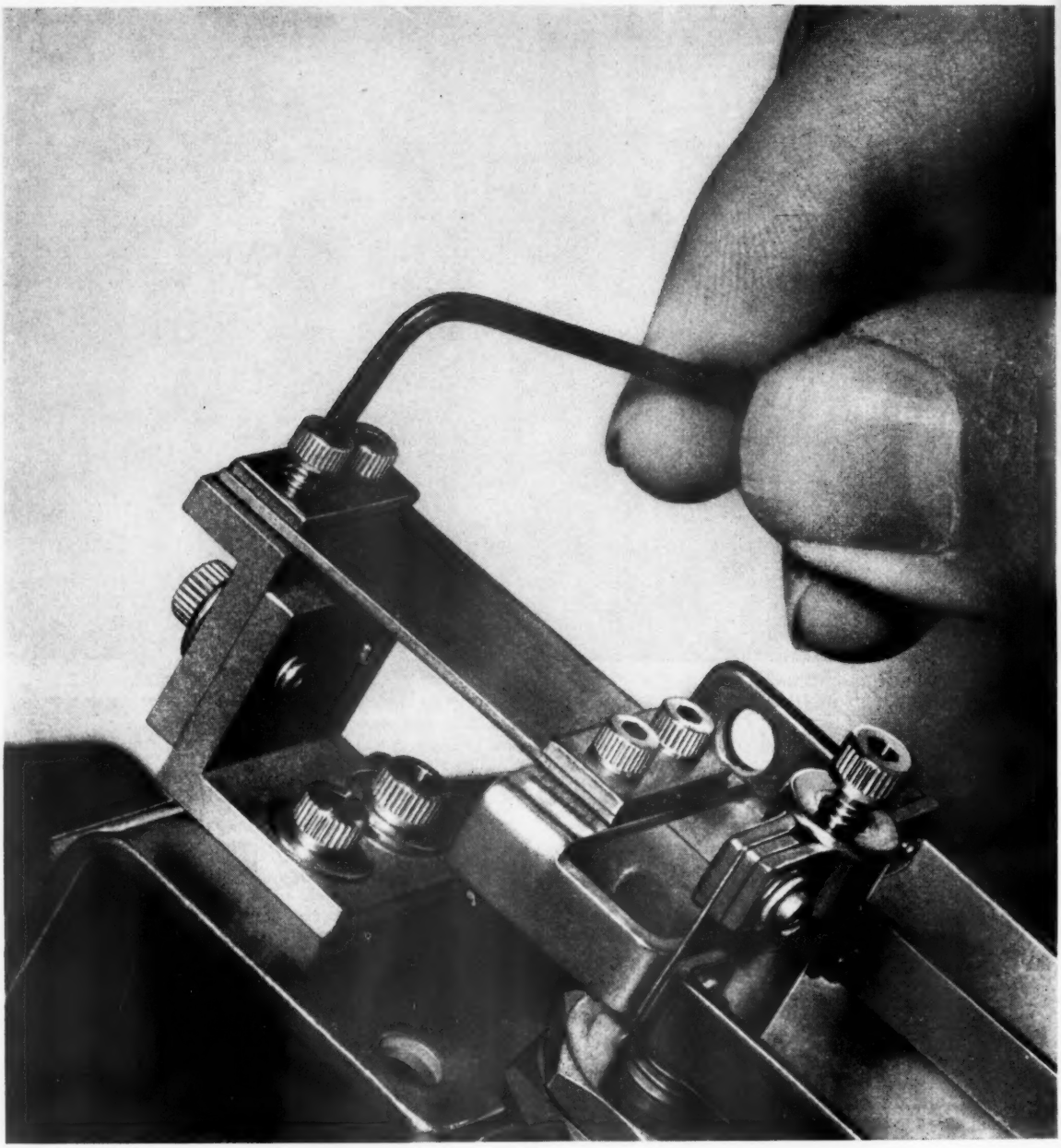
CLEARING MACHINE CORPORATION

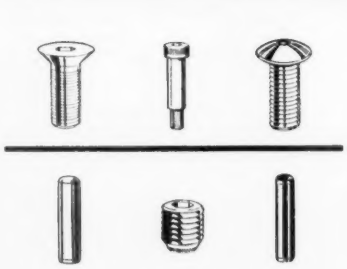
DIVISION OF U.S. INDUSTRIES, INC.

6499 WEST 65th STREET • CHICAGO 38, ILLINOIS

HAMILTON PLANT • HAMILTON, OHIO

UNBRAKO AT WORK



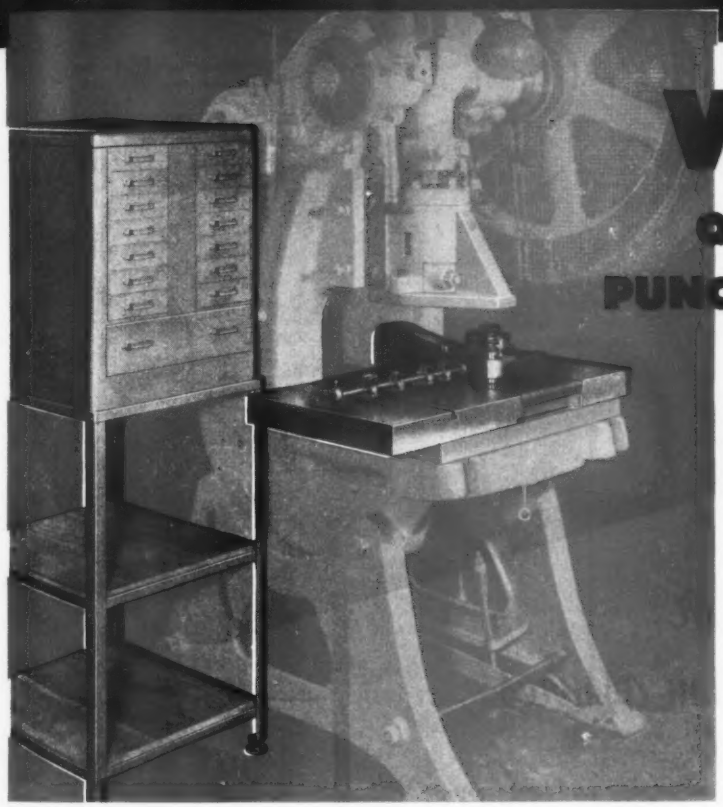


MINIATURIZATION. Small socket cap screws make possible smaller instruments. UNBRAKO Micro Socket Cap Screws range in size from #0 to #3, from ⅛" to ½" in length. But they have much more than microsize to recommend them. They are so strong that three UNBRAKOS will do the job of five ordinary cap screws. Or, if you must use the same number of screws, you can safely use smaller UNBRAKOS. All UNBRAKOS have knurled heads for easier handling and faster assembly, and uniform sockets for maximum wrench engagement. Your favorite industrial distributor always stocks UNBRAKOS. STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 38

Announcing



WALES

QUICK-CHANGE PUNCHING & GAUGING ASSEMBLY

Showing how easily and quickly the punch and die is removed and replaced in the Wales Quick-Change Holder for punching holes up to 1¼" in diameter. To remove the die, pull the holder forward and hit the punch head with hand which releases the ball-held die from bottom of holder. Punch assembly is merely lifted out of top of holder.

Showing Wales 3½" Holder for punching holes up to 3½" in diameter. This holder is not part of the "PPG Group" but is available as optional equipment.

Converts presses into a versatile hole punching machine with **20 SECOND PUNCH AND DIE CHANGE**

● This new, self-contained press accessory pays for itself in a matter of a few months...in some cases in a matter of weeks by such unusual time saving advantages as changing punches and dies in 20 seconds. Holder keeps punch and die in permanent alignment. Built-in adjustable gauging provides a new, simple, fast, accurate method of locating the work.

Popularly known as the Wales "PPG Group", it consists of a bed plate, quick-change holder, 18" back gauge bar, 18" stop support rail and a combination punch storage cabinet and tool rack.

This is too BIG a story to tell in this space, so write for illustrated PPG Bulletin.

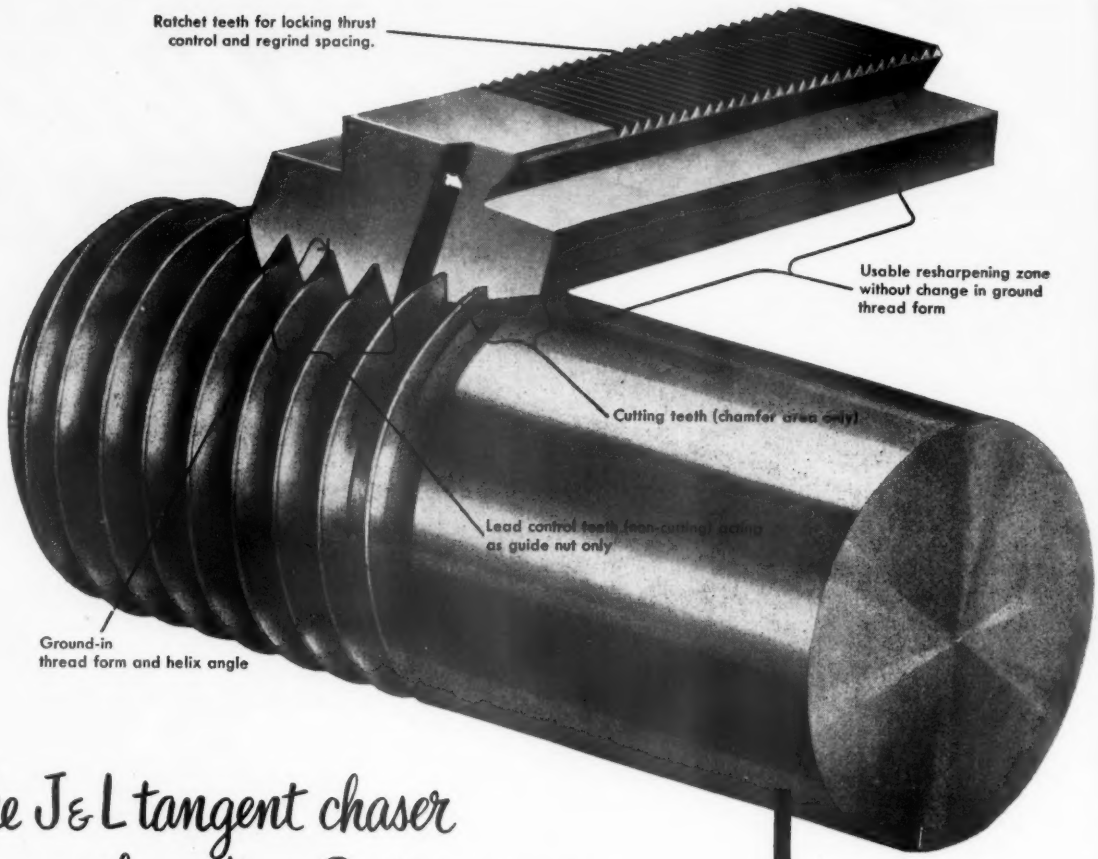
WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

358 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

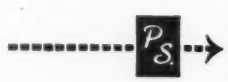
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO


Ratchet teeth for locking thrust control and regrind spacing.
Usable resharpening zone without change in ground thread form
Cutting teeth (chamfer area only)
Lead control teeth (non-cutting) acting as guide nut only
Ground-in thread form and helix angle

the J&L tangent chaser threading System assures...

... ease of operation ... maximum accuracy and tool economy — by means of a true tangent method of thread cutting exclusively developed by Jones & Lamson.

All four chasers in the set are positioned tangent to the work, making them cut like any other end cutting form tool. J&L tangent chasers have the thread form ground in at the exact helix angle for the size and pitch being threaded. Cutting action is confined to the chamfered area and the first full tooth in a set. The non-cutting teeth, purposely end ground above center, act as a precision lead nut. The non-cutting teeth on all four chasers act as a steady-rest and help control the lead with extreme accuracy. Class III guaranteed. *This means important savings regardless of your tolerance requirements.*



J&L Automatic Opening Die Heads and Chasers assure low initial cost — ease of operation — controlled resharpening — use of carbide where applicable. Class III threads guaranteed.

Write for free copy of *new* Jones & Lamson Tangent Die Head OPERATOR'S MANUAL.

Tangent Stationary Type
Capacities from #4 to 2"

Tangent Revolving Type
Capacities from #4 to 2"

Brown & Sharpe Types, capacities #4-1¼" — for #0 & #2 B&S machines & small turret lathes.

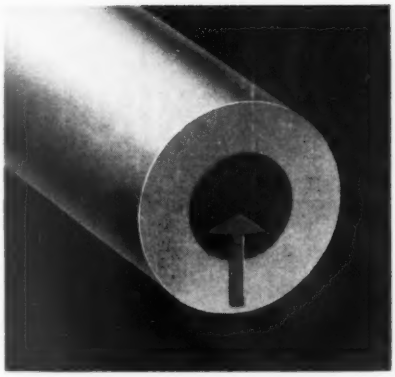
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 40

a hole here costs money...



a hole here saves money

Crucible Hollow Tool Steel Bars put savings into the pockets of the metalworking industry. There's no need for costly drilling, boring, cutting-off or rough-facing operations. For the hole is already in the steel you buy. You save production time, machine capacity—avoid scrap losses.

Crucible Hollow Tool Steel Bars are now available in any of our famous tool steel grades . . . in almost any combination of O.D. and I.D. sizes. And you get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels.

Your Crucible representative can show you how to save time and money with Crucible Hollow Tool Steel Bars. *Crucible Steel Company of America, Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

CIRCLE INFORM-A-GRAM KEY NO. 41

FACTORY ADDRESS:
SPRINGFIELD, N. J.

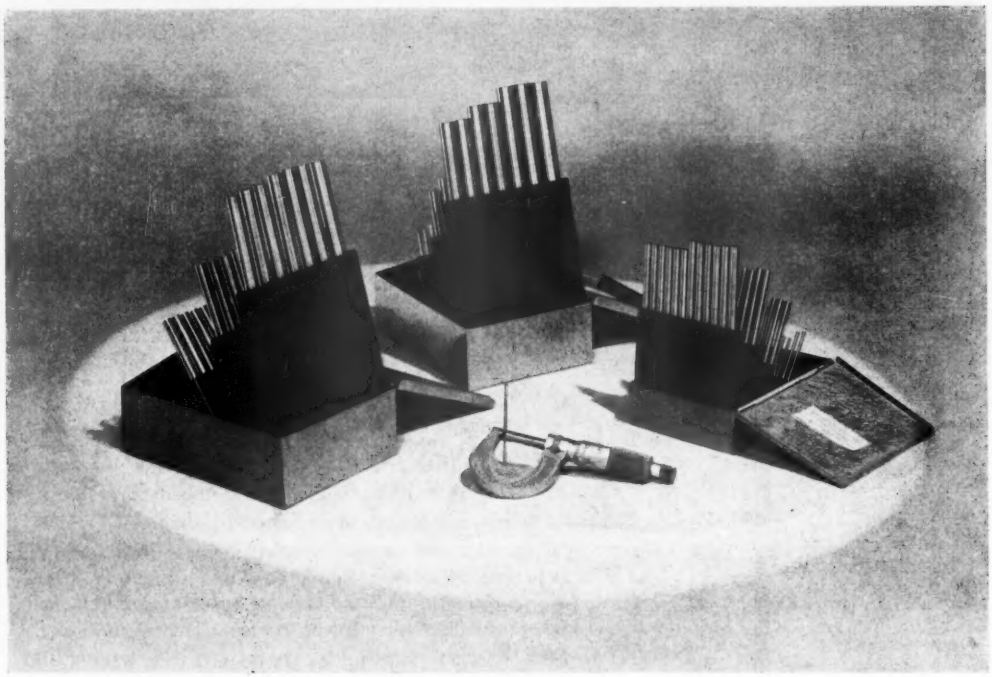
ESTABLISHED 1927
MILLBURN 6 4222

WILLIAM T. HUTCHINSON CO.

P. O. Box 328

UNION, NEW JERSEY

HUTCHINSON DRILL BLANKS



115 Pieces – COMPLETE – .040" to .500" – $75.00

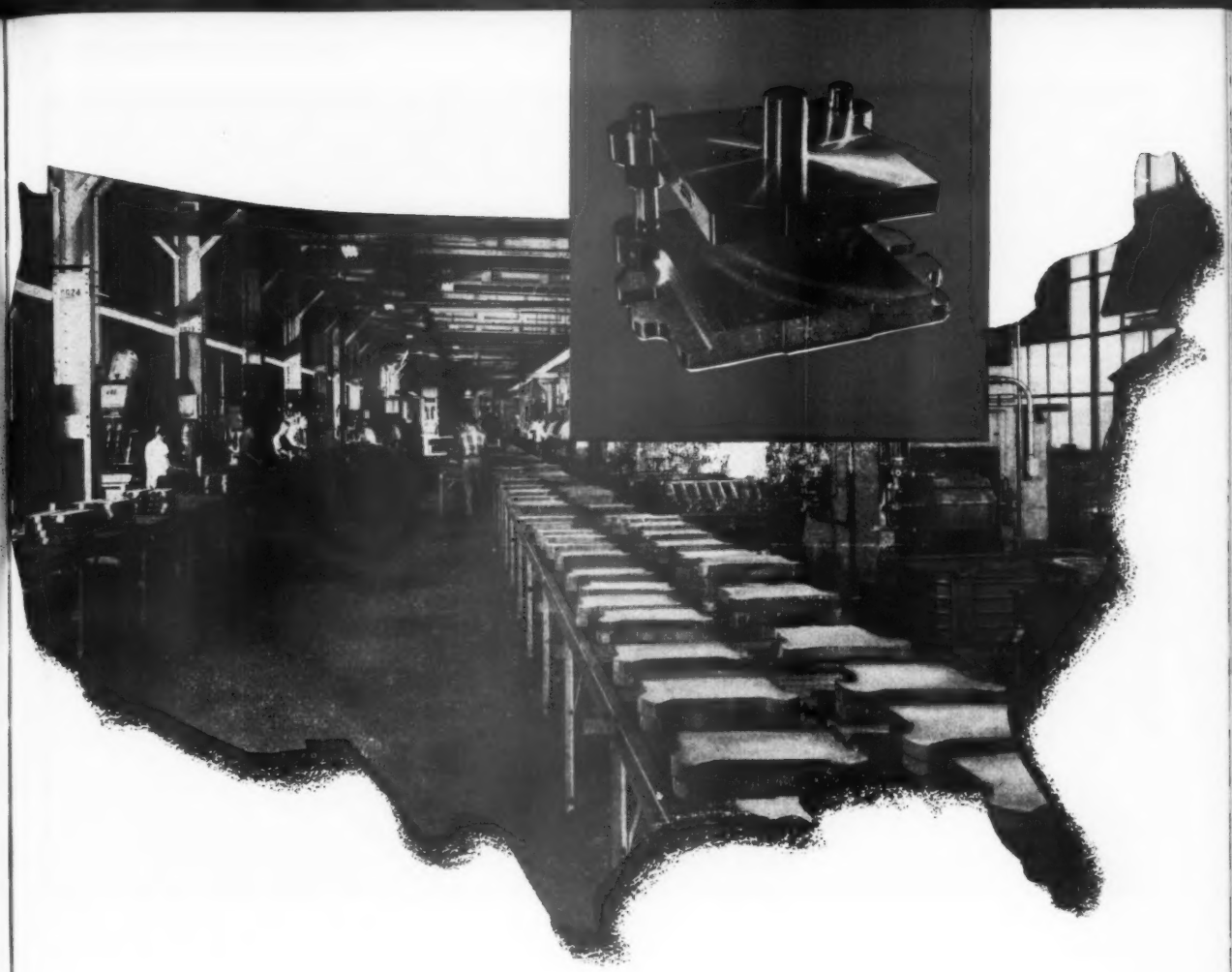
JOBBER SET	LETTER SET	WIRE SET
$26.65	$24.30	$25.15
in Huot Index	in Huot Index	in Huot Index

HIGH SPEED STEEL — 64 "C" scale hard-gage tolerance — mirror finish.

A NOTE TO REMEMBER

We have large stocks of semi-finished material ready to be ground to meet your requirements.

CIRCLE INFORM-A-GRAM KEY NO. 42



Here's the "how" of the fastest Die Set Service ever

FIRST, Danly is able to apply mass-production efficiency in manufacturing high precision, *interchangeable* die set components to the traditional Danly quality standards. **SECOND,** each Danly Branch is stocked with thousands of these *interchangeable* die set components, for immediate assembly to meet your tooling requirements. **THIRD,** Danly Branches are strategically located throughout the United States in major toolmaking centers to give you quick, local delivery. So, when you want the finest die sets in the shortest time . . . just call your nearby Danly Branch.

Which Danly Branch is closest to you?

BUFFALO 7	1807 Elmwood Avenue
CHICAGO 50	2100 S. Laramie Avenue
CLEVELAND 14	1550 East 33rd Street
DAYTON 7	3196 Delphos Avenue
DETROIT 16	1549 Temple Avenue
GRAND RAPIDS	113 Michigan Street, N.W.
INDIANAPOLIS 4	5 West 10th Street
LONG ISLAND CITY 1	47-28 37th Street
LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
PHILADELPHIA 40	511 W. Courtland Street
ROCHESTER 6	33 Rutter Street
ST. LOUIS 8, Mo.	3740 Washington Blvd.
SYRACUSE 4	2005 West Genesee Street

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Ill.

DANLY

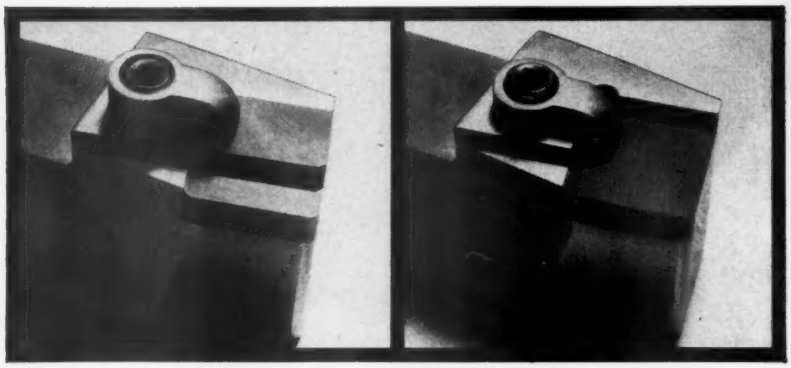
DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

NEW "TURNOVER" INSERTS

You have twice as many cutting edges on these clamp-on, "turnover" inserts. Use all edges on one side, then turn the insert over and use an equal number on the reverse side.

You can index a new Kendex insert in seconds. Simply loosen the sturdy top clamp and turn the insert to a new cutting edge . . . without disturbing the tool setup.

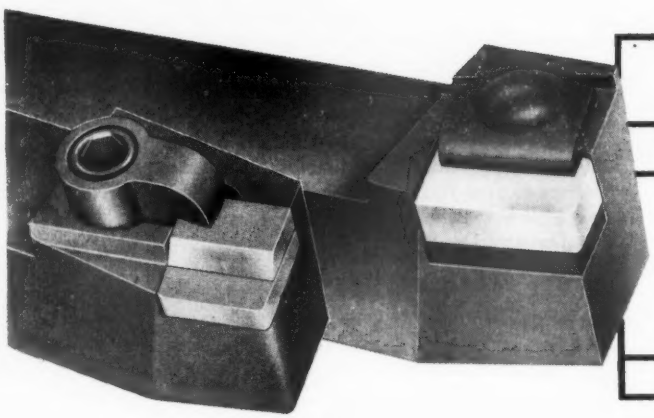
NEW CHIP CONTROL SYSTEM



These new Kendex Tools have an entirely new system of chip control that completely eliminates expensive chip-breaker grinding.

Clamped carbide chip breakers can be removed when not needed. Clamp has sufficient travel to hold insert without chip breaker.

New Kendex* Tooling has 2 big features



COST COMPARISON

(¾-inch tools required to provide 160 cutting edges)

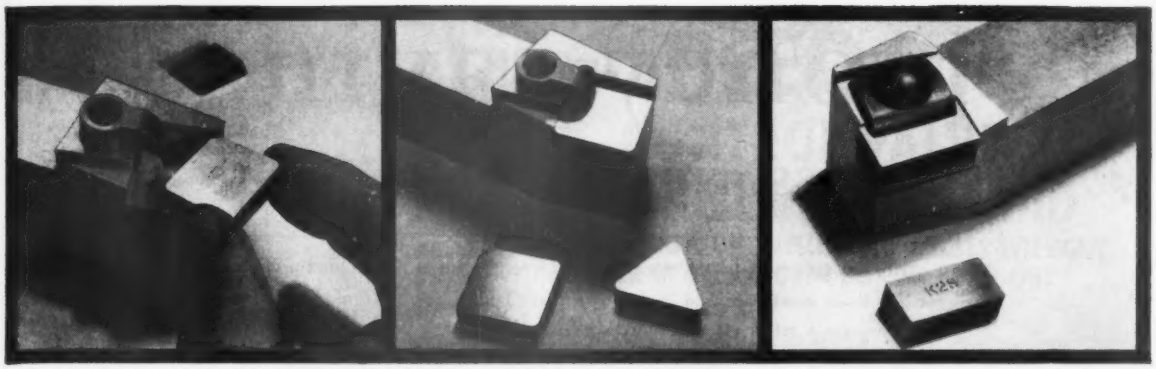
Standard Brazed Tools		Kendex KBR-12	
Cost of 23 tools	$ 44.62	20 inserts	$20.40
Regrind expense**	61.90	1 holder	6.50
Total cost	$106.52	Total cost	$26.90
Cost per edge	66.5¢	Cost per edge	16.8¢
**Six grinds per tool			

Total Kendex Savings $79.62

*Registered Trademark

MINING, METAL AND WOODWORKING TOOLS WEAR AND HEAT-RESISTANT PARTS ABRASION, CORROSION-RESISTANT

CIRCLE INFORM-A-GRAM KEY NO. 44



Each replacement insert fits accurately into the rugged, heat-treated shank, with the cutting edge perfectly aligned for use. No complex mechanism to adjust or fail.

For Standard Tools: "Regular" inserts (corner radii, top, and bottom surfaces ground) and "Precision" inserts (all surfaces ground) are available in square and triangular shapes.

For Heavy-Duty Tools: Standard molded blanks ground only on the corner radii for lowest possible cost per cutting edge. These blanks index within plus or minus 0.005 inch.

The carbide chip breakers on these tools have the widest effective range of application of any mechanical chip breakers known.

An indication of their effectiveness can be obtained from the two illustrations above. At left, 0.014 inch feed; at right, 0.036 inch feed—using same tool.

Kendex Heavy-Duty Tools have rigid, spring clamps which serve as chip deflectors. These inexpensive clamps are easily replaced.

to help you cut machining costs

A series of clamp-on, "turnover" inserts and a new system of chip control are helping users of this new Kendex Tooling slash tool cost per cutting edge by completely eliminating expensive grinding operations.

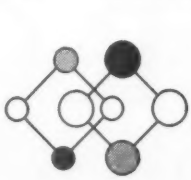
Two tools, the Standard and the Heavy-Duty, are designed to use the new Kendex "turnover" inserts which have cutting edges on not one, but *both* sides. Use twice the number of cutting edges before replacing these cost-cutting, "throw-away" inserts. And, the new top-clamp tool design enables you to index them in less time than ever before.

New Kendex Tooling not only eliminates regrinding of inserts, but the grinding of chip breakers as well. Standard sizes are equipped with replaceable, carbide chip breakers which can be removed, if desired. Heavy-Duty sizes are fitted with rigid, inexpensive spring clamps which serve as chip deflectors.

This combination of new "turnover" inserts and new system of chip control, plus the new top clamp for rapid indexing, is cutting tool costs on all types of machining operations wherever it is used.

See the cost comparison chart (*left*) and judge for yourself. This comparison indicates the *average* cost reduction that users have realized from this new Kendex Tooling. Call your Kennametal representative for a demonstration or write for additional information. KENNAMETAL INC., Latrobe, Pa. A 28

PARTS PERCUSSION AND IMPACT PARTS



INDUSTRY AND
KENNAMETAL
...Partners in Progress

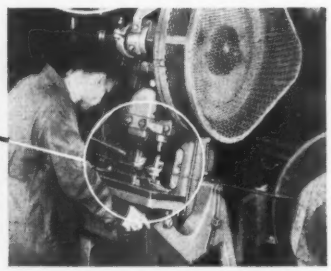
CIRCLE INFORM-A-GRAM KEY NO. 44

money saving

Accessories for your plant

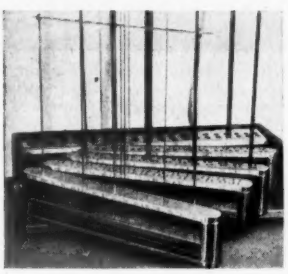
Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

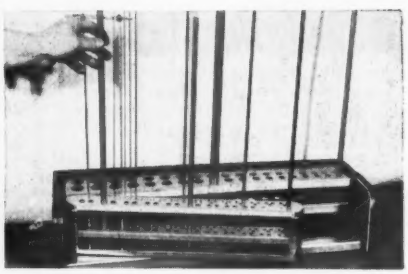
LEADER PIN OILERS



Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintain die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

DRILL ROD RACKS



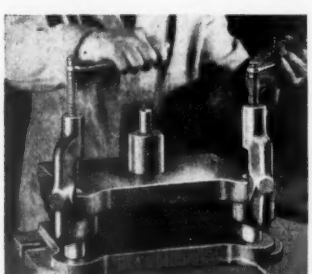


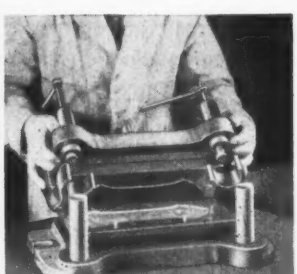
Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.

Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to 1/2" and in 32nds from 1/2" to 1" included.

Also available in half size with fractions or numbers.

DIE SET PULLERS





The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers. Available in three sizes.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-55

ACRO

METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 46

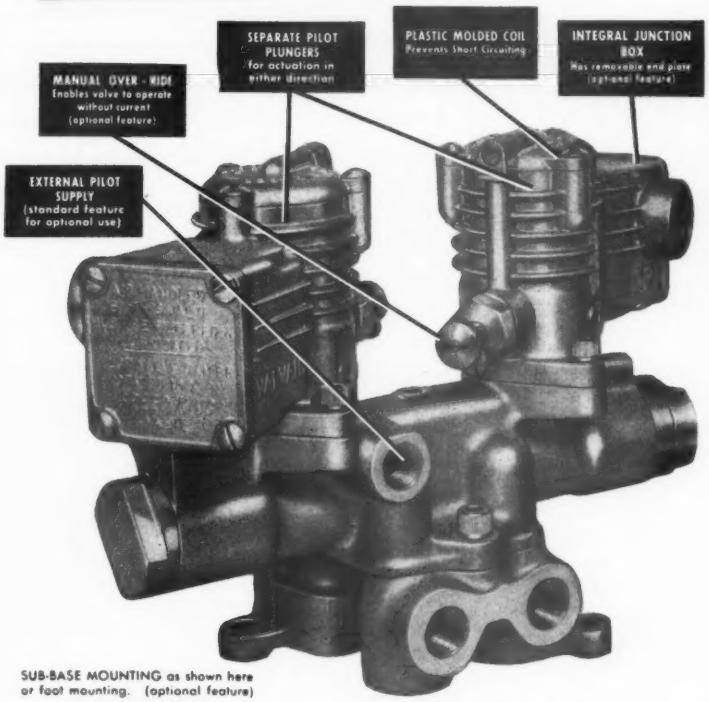
Automation Minded?

Valvair is proud to announce another advancement in the field of automation—The Double Solenoid Speed King Control Valve, designed especially for both the Original Equipment Manufacturer and the End User. This development proves that, more than ever before, Valvair is the name to keep in mind when you order solenoid-operated valves.

R. A. Reichelt
R. A. REICHELT
General Sales Manager

New SPEED KING CONTROL VALVE with DOUBLE SOLENOID

PERFORMS THROUGH MILLIONS OF CYCLES WITHOUT DANGER OF BREAKDOWN OR COIL BURN-OUT


SEPARATE PILOT PLUNGERS for actuation in either direction
PLASTIC MOLDED COIL Prevents Short Circuiting
INTEGRAL JUNCTION BOX Has removable end plate (optional feature)
MANUAL OVER-RIDE Enables valve to operate without current (optional feature)
EXTERNAL PILOT SUPPLY (standard feature for optional use)

SUB-BASE MOUNTING as shown here or foot mounting. (optional feature)

- 35 to 200 P.S.I.
- Vacuum to 300 P.S.I. (using external pilot supply
- Foot or Manifold Mounting in ⅜" size or ¾" size
- Compact
- Interchangeable
- Fully Enclosed
- 4-Way Body

DESIGNED & BUILT TO J. I. C. SPECIFICATIONS

The Double-Solenoid Speed King is the most rugged and compact valve made where speed, life and range of application are standards of comparison. SPEED: up to 600 cycles per minute for air service. LIFE: exhaustive tests show Speed King still operating millions of cycles over the 20 million mark. The life of this valve is further prolonged due to the fact that all parts are completely enclosed.

INTEGRAL JUNCTION BOX (Optional feature) Speed King is the only valve having a box cast with the housing of the pilot controls. Accessibility to electrical connections is provided for ease of installation and maintenance. The coils are molded, eliminating wear and shorts.

SIMPLICITY Only two moving parts: a single spool-type stem in the main valve body and the plunger in each pilot. No springs are used in the main valve, since air positions the stem in both directions. The solenoid pilot is removeable as a unit. Repacking can be done without disturbing the piping. One man can easily handle all phases of installation and maintenance.

MANUAL OVER-RIDE (Optional feature) This makes possible operation when electric current is off. Job set-ups can be made by one man without turning on the current.

VALVAIR offers both the ORIGINAL EQUIPMENT MANUFACTURER AND END USER A COMPLETE LINE OF AIR, VACUUM AND HYDRAULIC VALVES TO MEET ALMOST EVERY SPECIFICATION.

FIND OUT WHAT *New* DOUBLE SOLENOID CAN DO FOR YOU

VALVAIR CORPORATION
952 Beardsley
Akron 11, Ohio

GENTLEMEN:

Please send me complete specifications and information concerning:

- ☐ The New Double Solenoid Speed King Valve
- ☐ Single Solenoid, Pilot-Operated, Speed King
- ☐ The Complete Valvair Line
- ☐ I prefer to have your representative call

NAME _____ POSITION _____

ADDRESS _____

CITY _____ STATE _____

Valvair

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Affiliate: Sinclair-Collins Valve Company

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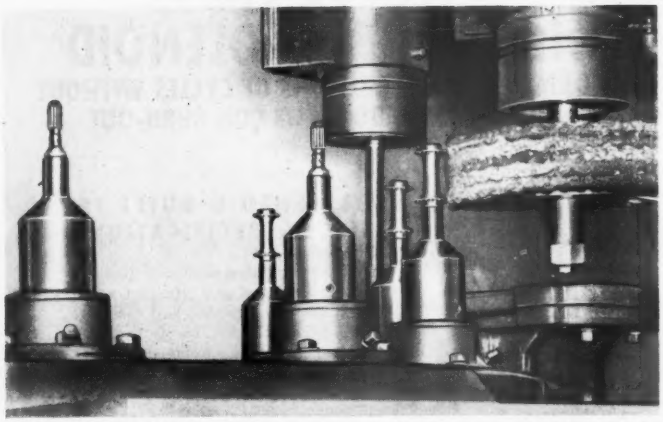
CIRCLE INFORM-A-GRAM KEY NO. 47

Self-release, greater grip, automatic alignment of ERICKSON MANDRELS speed small to large part loading



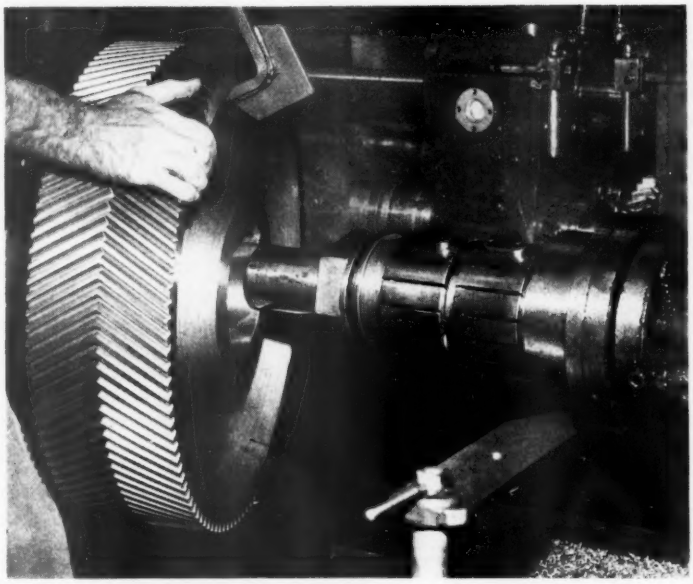
SMALL ERICKSON MANDRELS play a big part in holding down production costs for leading bicycle parts manufacturer. Here you can see how Erickson drawbar-operated, precision expanding mandrels speed wheel hub loading for buffing operation. Ease of operation and instantaneous release have greatly speeded this quantity production holding problem.

Regardless of size, Erickson precision expanding mandrels operate on Erickson's famous double-angle principle that not only assures guaranteed accuracy of .0005" T I R, but also makes mandrels self-releasing. They are available for air, hydraulic or manual operation. Special mandrel sleeves are designed to match various internal forms. AA-72

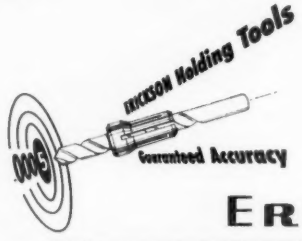
ERICKSON MANDREL ADVANTAGES

- Instantaneous self-release greatly speeds loading and unloading
- Greater holding power because grip extends over entire sleeve length . . . stops wobble and chatter
- Guaranteed accuracy of .0005" T I R
- Each sleeve covers a range of 1/32"
- Sleeves are interchangeable on mandrels of same series

Are you bothered by a tough internal holding problem? Then let us prove that Erickson mandrels speed production for lower unit costs. Give us a call today or write for catalog K.



ERICKSON MANDRELS speed large part handling, too. See how easily this heavy shovel gear, 24 inches in diameter, is being loaded for gear cutting at the Alten Foundry and Machine Works, Inc., Lancaster, Ohio. Larger shovel gears up to 61 inches in diameter are handled just as easily. At Alten Foundry, using an Erickson mandrel, loading and automatic alignment require only 10 percent of the time required by plants using solid arbors and arbor presses. Even this large mandrel is self-releasing. Operator fatigue is practically eliminated.



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CIRCLE INFORM-A-GRAM KEY NO. 48

a long look, and a good look

This is the time of year when business forecasts come at a dime a dozen. It is a pretty safe bet that 1955 will be better on all counts than 1954.

The acceptance of this is predicated on the evolution of our economy from one of extremes — boom or bust — to an economy that is more like a highway to a mountain top; a few switchbacks and horseshoe curves but with occasional observation points where we can pause and look back upon whence we came.

Then do we realize that our progress has been upward — upward and onward. The look backward is satisfying, but the look ahead is inspiring.

Today the far-seeing business man — in office or plant — is looking much further into the future than one year. He is more concerned about five and ten years from now. The further he looks ahead, the wider the field of view that he must encompass. The picture he wants must be taken with a wide angle lens rather than a telephoto.

It is fitting and proper for him to pinpoint his immediate directives and actions to his year-ahead markets, costs, tooling, and distribution problems. But his long look ahead, with its wide field of view, must include the state of the world as well as the state of the nation. Both elements of the picture as seen from 1955's observation point look good; better than ever before.

He sees that, as both we and any enemies increase the devastating potential of atomic armaments, the likelihood of a military World War III becomes more remote. As the peoples of the world acquire greater knowledge of this military science, there comes a fuller and more widespread understanding of the only consequence of unleashed atomic warfare — total oblivion.

He sees every indication that World War III will be waged on a civilized front — the battle to provide civilian needs. The ammunition for this battle is capital investments and expansions, better housing for more people, more and better highways, and all the other ingredients of the high standard of living that is commonplace in his own country.

He sees his country as the long-established proving grounds for this kind of ammunition, and he sees himself and his fellows willing and eager to pass the ammunition to other peoples — be it spot-welding know-how or industrial and humanitarian applications of nuclear energy.

Our forward looker sees that the economic recovery that has been made by the free nations of western Europe has, almost solely, been made by filling civilian needs. People are coming to realize that satisfying the hunger for goods and services is a powerful deterrent to war.

This natural human hunger and need for goods and services can not be pent up forever behind iron curtains. Sooner or later it will build up an internal economic pressure which will act, behind their own lines, to spike the guns of would-be aggressors.

On the home front, today's business man's long look is given a ten-year magnification by a projection, just made by the Joint Committee on the Economic Report, of our economy's potential in 1965: a 20% increase in population to 190,000,000; a 40% increase in output per man hour with a slight decrease in hours of work; all adding up to a 50% increase in total national output — to $535 billion.

The 1955-65 look is a long one and a good one — for enterprise, for our country, and for the world.

E. Willard Pennington

editor

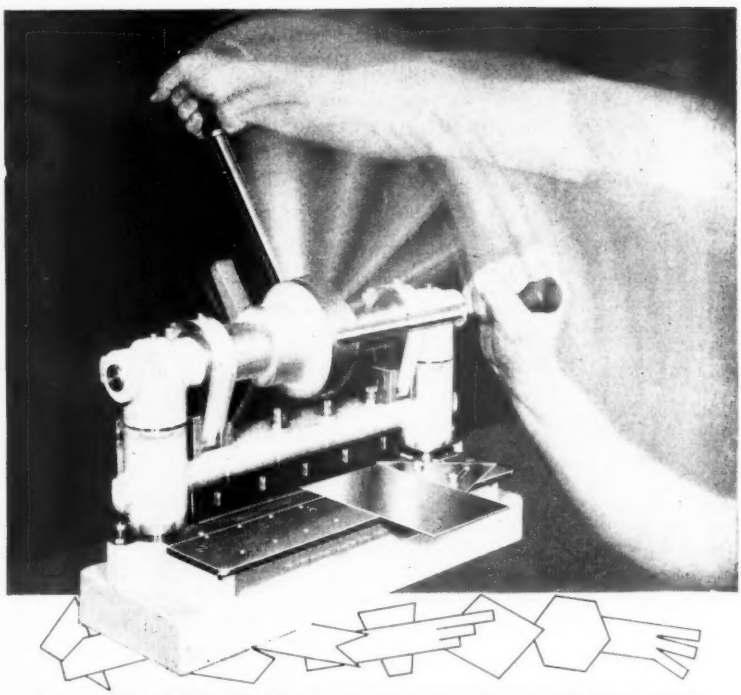
Editorial Index

DEPARTMENTS

SHOP AIDS 133
Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PUBLICATION PREVIEWS 134
Capsule description of current literature. Bulletins, brochures, catalogs and circulars — You name it.

PROGRESS ON PARADE 146
Check this carefully. It can bring new efficiency to your operation. This newest in machines, tools, and accessories.



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CIRCLE INFORM-A-GRAM KEY NO. 50

EDITORIAL. A Long Look and A Good Look 49

— FEATURES —

DEFENSE PREPAREDNESS. "The Crystal Ball" by Herbert L. Tigges, Baker Brothers, Inc. 8
What are we going to do if attacked by a foreign power? This is a question Mr. Tigges asks and then suggests the actions which should be taken by the machine tool builders, the metalworking industries and the government.

PRIMER TUBES. "Fast Process Tooling Speeds Primer Tube Production" by Herbert Chase 53
Converting ribbon stock into tubing, redrawing to finished size, threading one end and cutting off to short lengths, piercing transverse rows of holes, and spinning one end closed are the operations performed in making primer tubes.

WELDING. "Automatic Arc Welding Increases Heavy Press Component Assembly" by B. M. Gragg and W. A. Bohlander, The Hydraulic Press Mfg. Co. 57
Obtaining faster and better arc welding on heavy press components has been accomplished at The Hydraulic Press Manufacturing Co., by use of an unusually versatile automatic welding machine.

DIE CASTING. "Ternstedt Promotes Speed and Safety in Die Casting" 61
Safety and speed have been built into the die casting machines used for producing zinc alloy die cast automotive "hardware". They operate on automatic cycles started by pressing a button.

ULTRASONICS. "Ultrasonics . . . A New Approach to Sinking Mold & Die Cavities" by David C. Kauffman, Cavitron Equipment Corp. 63
An entirely new method of sinking molds and die cavities has been developed which is particularly effective in hard "unmachinable" materials.

TAPPERS. "Air Powered Tappers Reduce Rejects" by W. C. Hunter, J. Leukart Machine Co., Inc. 66
Acceptance or rejection of expensive aircraft parts can depend to a large extent on the accuracy of tapped holes. Air powered tappers installed at Leukart reduced their rejects from 12% to ½%.

Editorial Index

QUALITY CONTROL. "A Four Step Plan for Controlling Quality in Process" by Michael P. Agresta, Pesco Products, Div., Borg-Warner Corp. 69

Procedures followed in establishing a Quality Control In-Process program at Pesco is described and a demonstration is given by showing the use of work sheets and charts to determine the process capability of an operation.

TRAINING. "In-Plant Training Pays Off In Greater Production at Less Cost" by R. W. Phelps, Kennametal, Inc. 104

A program for increasing the output of carbide tools has been instituted by Kennametal in the form of in-plant training of machine operators. Mr. Phelps explains the program.

TRANSFER MACHINES. "Designing Dependability and Safety into Transfer Machines" by Judson H. Mansfield, Greenlee Brothers & Co. 112

The function of a transfer-machine cycle is to transfer the workpiece to first station and from station to station. Mr. Mansfield discusses the factors necessary to make such an operation safe and dependable.

AUTOMATION. "Influence of 'Automation' on Machine-Tool Design" by F. R. Swanson, Sundstrand Machine Tool Co. 120

Designing a highly automatic machine tool to perform its operation continuously, reliably and with little attention requires the consideration of many elements which do not enter the design of a comparatively simple machine.

— SHORTS —

Chemical Milling 56
Quality Control—a feature of Multiple nut runners 60
Pneumatic Tubes Speed in-Plant Communications 68
Industrial Metallurgy 106
Constructional Jig System 110
Solar Installs Blanchard Units for Grinding 111
Sheet Stock Handling Simplified 116
Apprentice Program Merits Award for NTDMA 122
Monsanto Film Shows Progress of Shell Molding 124
Standard Machine Tooled for Special Purpose 127
Sliding Sub-Bases Make Versatile Drill Units 128

DEPARTMENTS

COMMENDABLE COMMENTS 32
WILL YOU BE THERE? 102
GROWING PAINS 117
CALLING CARDS 141
WHAT'S NEW IN PLASTICS? 142
MEN YOU SHOULD KNOW 144

Grind Perforators with a maximum of precision. Get a life time of service with the new Grind-All fixture. Particularly adapted to the grinding of carbides, this precision tool will grind regular or irregular shapes concentric with shank within ± .0002. Time saving up to 300% and widest operating range.

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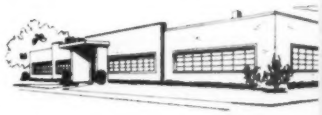

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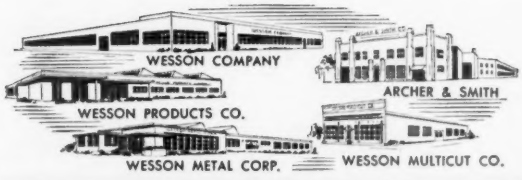
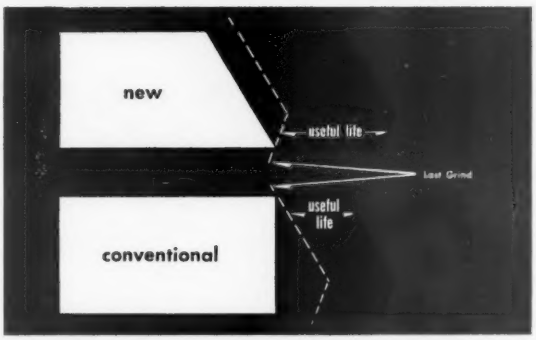


carbide NEWS

Carbide Tip Waste Cut 30%



Wesson milling cutter blade design has base parallel with peripheral cutting edge; permits more regrinds per blade

Reduction in carbide waste is assured by the new milling cutter blade, at top, since base of carbide tip parallels the peripheral cutting edge. Conventional blade is shown below.

A new carbide-tipped milling cutter blade design now incorporated into the Wesson Rigidicut milling cutter line is producing an increase of 30% or more in blade life.

Tipped with Wessonmetal carbides, the new blade permits maximum carbide usage and enables many more regrinds per blade.

The new blade design is compared with old style blades in the sketch at the left. In the new blade, the base of the carbide tip is parallel with the peripheral cutting edge, eliminating waste.

Because of the success of the new design in extensive field application tests, it is now standard in most Rigidicut cutters in the fine pitch and coarse pitch series. Additional economy results since these blades are being made available at no increase in price.

Complete engineering data and price information on the entire Rigidicut milling cutter series is available from Wesson Company, Dept. AD, 1220 Woodward Heights Blvd., Detroit 20, Michigan.

Wesson Metal Now In Top 3

With the official opening recently of a new and modern carbide plant in Lexington, Ky., Wesson Metal Corporation entered the ranks of the three largest carbide manufacturers in this country. A model of scientific design, the new Wessonmetal plant occupies over 40,000 square feet of manufacturing space.

In the new plant, greatly expanded research and development facilities will highlight continued development of new carbide metal-cutting grades. The company's quality control laboratories contain some of the most advanced scientific equipment available.

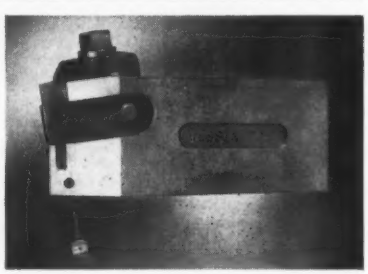
The new plant, which houses some entirely new manufacturing and quality control developments, will more than double the productive capacity of previous facilities. Working at virtually full capacity already, the new plant is keeping pace with wide-spread demand for the complete line of Wessonmetal carbides.

A substantial portion of the plant's capacity is being devoted to output of the latest Wessonmetal development in steel cutting grades. The new steel cutting grade promises to be the most significant carbide development since the introduction of steel cutting carbides.

New Multicut Holder Gets Peak Efficiency From Fischer Lathes

Popularity of the Fischer copying lathe springboarded the development of a special band-type Multicut tool holder. Coupled with the steel band used on all Multicut holders is a new top clamp that assures rigidity of insert when the tool is recessing or going through the out-facing cycle.

Combination of band and clamp permits closer tolerances and finer finishes in the complete range of Fischer lathe applications. Finish turning is eliminated in many operations. The holder uses standard Wessonmetal D-55 inserts.



Closer tolerances and finer finishes result from band and clamp used in Multicut holder.

CARBIDE DATA

Additional information and specifications available:

☐ 121 page catalog covering complete standard and special Rigidicut milling cutter and blade line.

☐ Specification-Data Sheet on special Multicut holder.

Get data by writing to:
WESSON COMPANY, Dept. AD,
1220 Woodward Heights Blvd.
Detroit 20, Michigan

tools Wesson carbide Wessonmetal

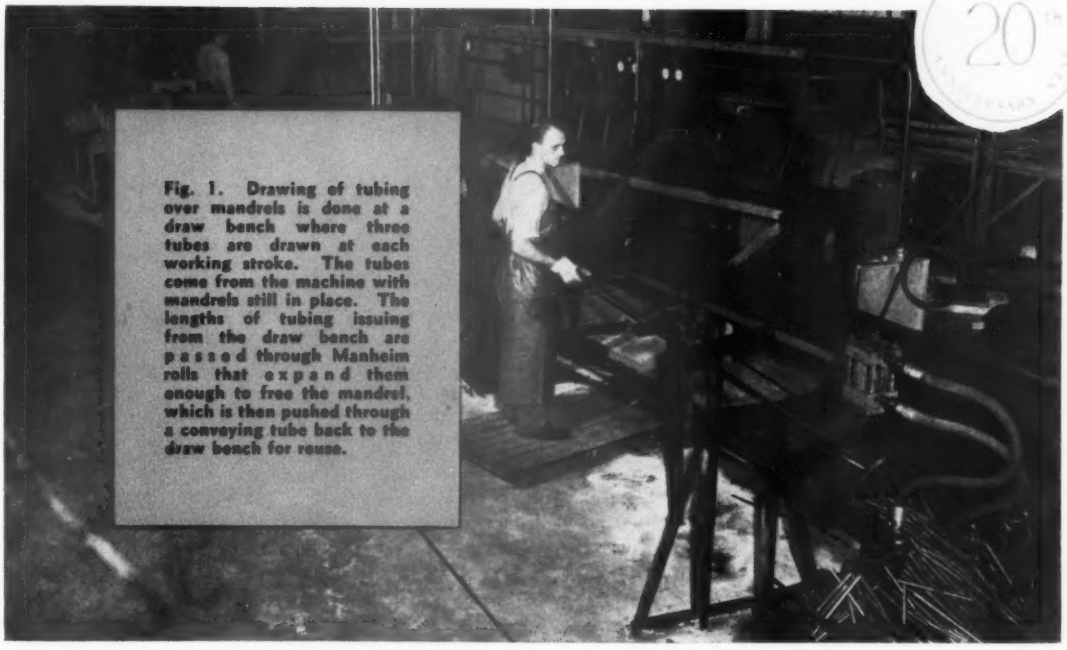


Fig. 1. Drawing of tubing over mandrels is done at a draw bench where three tubes are drawn at each working stroke. The tubes come from the machine with mandrels still in place. The lengths of tubing issuing from the draw bench are passed through Manheim rolls that expand them enough to free the mandrel, which is then pushed through a conveying tube back to the draw bench for reuse.

FAST PROCESS TOOLING SPEEDS PRIMER TUBE PRODUCTION

by Herbert Chase, M. E.
Forest Hills, N. Y.

A HIGHLY SPECIALIZED service in one large contract manufacturing plant is the production of steel tubing and the fabrication of lengths of such tubing to customer specifications. One of the more voluminous end products is primer tubes for shells, made for the Ordnance Department of the U. S. Army.

These primer tubes constitute the central element of the shell and their function is to hold the primer charge that ignites, through radial holes, the remainder of the charge in the shell. The contractor fabricates the tubing, sizes long lengths by drawing (some is drawn over a mandrel), cuts these into shorter lengths and completes all other processing so that the primer tubes are ready for shipment to shell loading arsenals. Several diameters and lengths of tube are fabricated. Some have one end sealed by a spinning operation and, in others, the corresponding end is closed by a brass cap, pressed and silver soldered in place.

Tubing is produced from ribbon steel in continuous lengths which, after testing, are cut into shorter lengths to be drawn to final size. These lengths are "pointed" (necked at one end to pass through the draw dies) by rotary swaging and then go to the draw bench shown in Figure 1. This is a 20-ft hydraulic bench and handles three lengths per draw.

Before the draw, a hardened steel mandrel is run into each length and the pointed end of each tube is started through the draw die by hand before being gripped by the tongs that pull it on through. In a typical case, the tube measures 0.656″ I.D. and 0.750″ O.D. before

Long lengths of tubing are first pointed and then sized by drawing over a mandrel. Screw machine threads one end and cuts off short lengths. Magazine press pierces transverse holes. Some tube ends are closed by a spinning operation, others are capped and silver soldered.

drawing and the mandrel is 0.445″ in diameter. Drawing causes the tube to tighten on the mandrel and, to remove it, the tube is passed through Manheim rolls that expand the tube enough (0.010″) to withdraw the mandrel. The latter is then placed in an overhead transfer tube and pushed back to the loading end of the bench for reuse.

After coming through the Manheim rolls, the tube measures 0.455″ I.D. and 0.684″ O.D. In another draw, without a mandrel, these dimensions become 0.451″ and 0.644″ respectively, which is the final size of the length. It then goes to an Acme-Gridley screw machine where after tapping the outer end, the piece is cut to a finished length of about 10″. In cutting off, the other end is chamfered.

Lengths thus sized go to the special automatic perforating press, Figure 2, and are loaded into a hopper, similar to that in Figure 4, from which they feed down two magazine channels for duplicate operations on two lengths at a time. From the channels, each of the two lengths is pushed into a die which then closes to hold the piece while punches are lowered by the hydraulic ram of the press. Eleven punches pierce two rows of holes, passing through opposite walls, and the slugs drop out below the dies.

After the punches are withdrawn, the tubes, while remaining in the dies, are rotated 90° and advanced by half the distance between hole centers. The punches again come down and pierce a second set of holes 90° from the first set and staggered in relation to them. Then punches are again withdrawn, the dies open, the tubes are pushed out and the dies are refilled to start the next cycle of the press. The perforated tubes when pushed out drop into tote pans for the next operation.

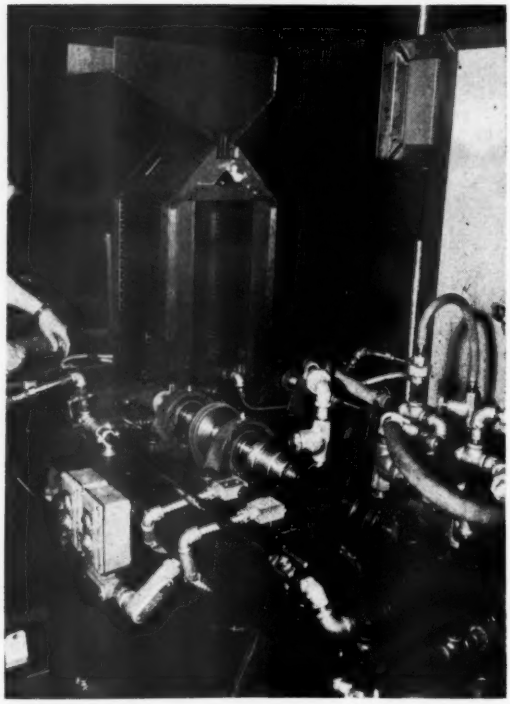


Fig. 3. Double-spindle machine in which tubes, fed from the hopper in background, are gripped while being pressed into rotating carbide or Stellite dies that spin the end closed. Heat generated by friction serves to soften the steel.

Except for tubes of large size, the next operation is to close one end of each tube by a spinning operation. This is done in a machine, Figure 3, having two spindles that are driven by V-belts. On each spindle is a Stellite or carbide die having a domed recess. There is a holding fixture aligned axially with each spindle and these fixtures are loaded automatically from a hopper and magazine chutes shown in detail in Figure 4.

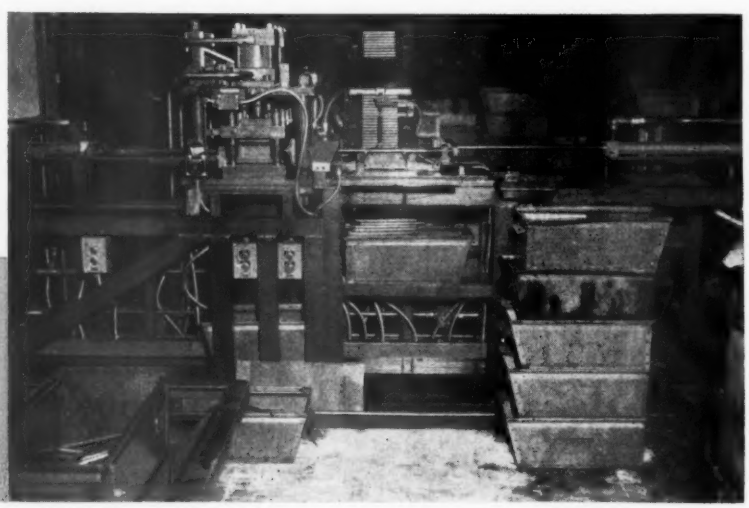


Fig. 2. This special machine with two dies and hopper feed was designed to pierce radial holes in the walls of primer tubing, two pieces at a time, using a hydraulic press.

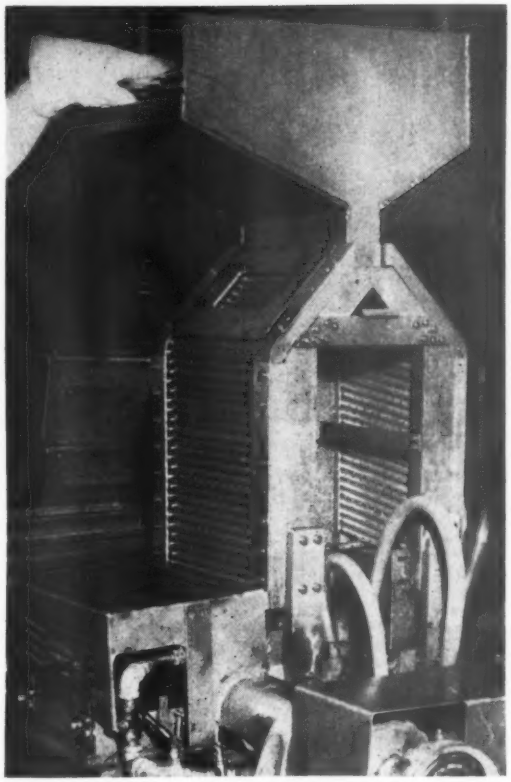


Fig. 4. Close-up showing the hopper and dual magazine chutes that feed lengths of pierced tubing automatically to the fixtures which grip the tubes for the spin-closing operation.

After the holding fixtures are loaded and closed to grip the tubes, they are advanced axially by hydraulic rams that force the outer end of the tubes into the rotating dies and maintain the pressure until spinning is completed. Friction between the dies and non-rotating tubes generates heat that softens the metal and permits it to form readily. Spinning "domes" the ends of the tubes and closes them completely. With this, the operation is finished and the fixtures are retracted, unloaded, and reloaded to start the next cycle.

In the case of primer tubes of large diameter, one end is closed with a brass cap rather than by spinning. Caps are first brought to size in a screw machine that produces a shoulder and a short cylindrical end portion turned to a press fit into the bore of the tube. Application of the cap is done in the machine shown at the right in Figure 5. The tubes are loaded in a hopper and are fed down a magazine chute. The machined caps and rings of silver solder are fed to an indexing head by vibrators. Soldering flux is applied as a hydraulic ram presses the cap in place.

As the capped tubes come from the machine, they are positioned vertically in a rotating fixture (to the left in Figure 5) that carries the capped ends through eleven gas flames. These apply sufficient heat to melt the rings of silver solder which is drawn by capillary action into the joints and produces a strong bond to hold the caps securely to the tubes. As soon as soldering is completed, the tubes drop from the fixture into a cooling quench. All primer tubes are washed, dried, and then dipped in varnish to protect against corrosion.

As has been shown, this contractor's primer tube production is run at a high volume in which most operations are performed on automatic or semi-automatic machines. Although several of these are limited by design to a specific operation, the time saved by elimination of hand work more than justifies their cost.

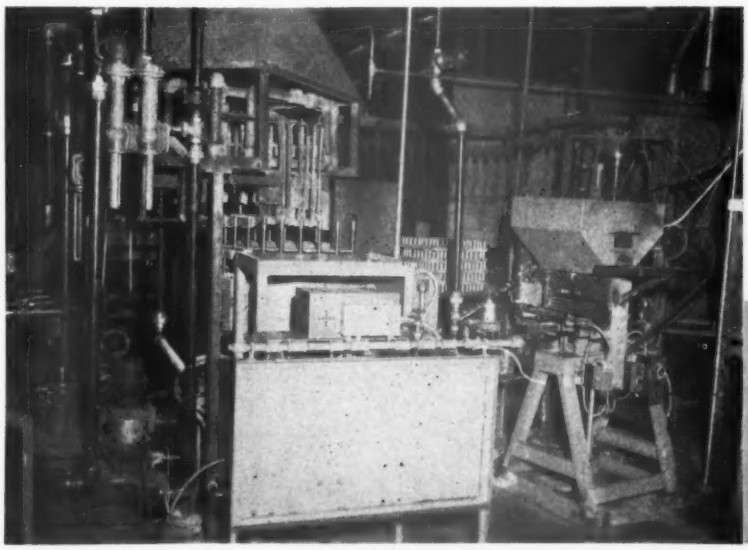
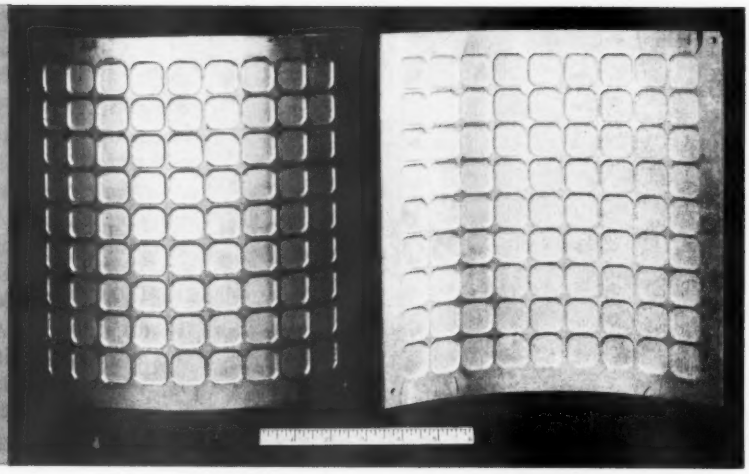


Fig. 5. Brass caps and rings of silver solder are applied to the larger sizes of primer tube by the semi-automatic machine at the right, after which the solder is melted by gas flames while the tubes travel in the rotating fixture, upper left.



Two curved plates are chemically milled to form a waffle-type grid. The two matched plates are then joined at the islands to produce a stiff but lightweight sandwich structure.

CHEMICAL MILLING
. . . *a new manufacturing process*

ONE OF THE MOST REVOLUTIONARY developments revealed during 1954 was the Chem-Mill (chemical milling) process announced jointly by North American Aviation, Inc. and Turco Products, Inc. Originated by North American, the new process permits precision forming of many complex shapes from metal sheets and forging stock, without any need for costly machining or presswork.

To prepare a part for chemical milling, the metal to be removed is left exposed, while the rest of the part is masked with a specially developed coating. The entire part is submerged in an alkaline etching solution prepared by Turco. The solution attacks exposed surfaces evenly at a constant rate until the desired amount of metal has been etched away. The parts are then removed from the etch solution and rinsed.

Electronically-controlled, the process produces metal surfaces to accuracies of 0.002". While most work done to date has been on aluminum, the process has been successfully applied to steel, stainless steel, titanium, and other metals.

The process may be used to re-dimension parts to closer tolerances; to do such tapering, curving, and other intricate shaping as is impractical with conventional equipment; to reduce part weight by embossing a lightening pattern; and to reduce metal thickness on drawn parts with compound curvatures where heavy gauge is used to prevent cracking during the press operations. It is expected to have its greatest application on parts yet to be designed —parts that would be impractical for manufacture by other methods.

Chem-Milling removes metal uniformly over those areas not masked by brushed or sprayed coating, adhesive tape, rubber-sealed template, or electroplate.

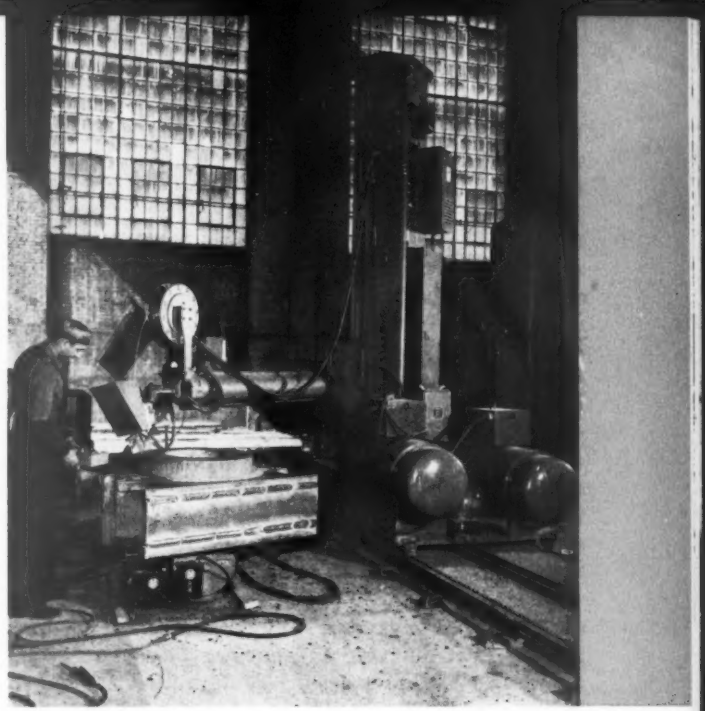


Fig. 1. New Herrick automatic arc welding machine, equipped with a Lincoln head and Lincoln generators recently installed in the Hydraulic Press Manufacturing Company plant. The column turns on a table that rests on a carriage traversing a 40′ track. The boom is adjustable both vertically and longitudinally.

AUTOMATIC ARC WELDING FACILITATES HEAVY PRESS COMPONENT ASSEMBLY

by B. M. Gragg
Welding Superintendent
and
W. A. Bohlander
Factory Manager
THE HYDRAULIC PRESS MANUFACTURING COMPANY
Mt. Gilead, Ohio

Major press builder installs a unique automatic machine - - a welding head mounted on a free swinging boom supported by a vertical column that will rotate 360° and traverse along a 40′ track, making welds anywhere within an area measuring 28′ x 64′.

TO SOLVE THE PROBLEM of obtaining faster and better arc welding of the many HPM press weldments our company recently rebuilt its weldery.

These weldments include welded joints on plates and other components up to 12″ or more in thickness. Until recently most of the work was done by hand arc, although it ordinarily required multiple passes. Some work continues to be of this type, partly because welds often are not accessible for the use of an automatic welding head.

There are cases also in which parts are too heavy to be shifted economically into positions convenient for automatic welding even though faster welding and better welds are made by automatic heads. Partly for such reasons, it was decided to install a new and unusually versatile automatic welding machine which is illustrated in Figure 1.

This machine was designed and built by C. B. Herrick Manufacturing Corporation after consultation with HPM and with Lincoln Electric Company engineers — the welding head, controls and generators being built by Lincoln. A noteworthy feature of the machine is its versatility and its ability to make welds anywhere within a floor space of 28′ x 64′ and at heights up to 12′ above the lowest head position. Because of this flexibility, welds can be made in several locations without moving the weldment.

Moreover, while a setup is being prepared in one location, welding can proceed at any other location within the area served or in several successive locations. Consequently, the machine can be in use a large percentage of the working day and need not be kept idle pending the completion of any one setup. In addition welds can be made at maximum speed partly because generator capacity is large and either one or two electrode wires can be used.

This means not only rapid deposition of weld metal but likely reductions in warpage because

when welding is done so fast, the weldment does not pick up heat so rapidly; hence, dimensional changes are reduced. Also, when desired, work at one location can be discontinued to allow cooling while the head is quickly shifted and does welding elsewhere on the same weldment or on another weldment.

These results are made possible both by providing equipment of high capacity and by designing the machine so that the head can be traversed rapidly and can be moved from location to location quickly. As Figure 1 shows, the head is supported on a tubular boom which itself is supported on a sturdy vertical column. Between the two there is a carriage that can be moved a maximum of 12′ vertically and so alter head height by this amount.

Besides this, there is within the carriage, motor driven means for moving the boom parallel to its own axis as much as 12′ and at any desired welding speed. To permit swinging the boom horizontally into any angular position in planes parallel to the base, the column is mounted on a table that can turn 360° about a vertical axis. Finally the column with the table is on a carriage that can be traversed horizontally by a motor driven pinion engaging a fixed rack along a 40′ track.

Thus, the column with its boom can move from end to end of the track and can be set at any angle about its vertical axis. The boom can also be traversed 12′ horizontally along its own axis and can also be moved up and down 12′. Its carriage for vertical traverse swings with the column. It is also possible to swing the welding head about a horizontal axis and to give it the usual fine adjustment needed to place the electrode (or electrodes) precisely where the welding is done to best advantage.

Both of the two 900-amp Lincoln generators are on the carriage that moves along the base track, hence they travel along the track with the column and the boom that it supports. This facilitates shifting of heavy cables and minimizes the distance they must move.

Above the area served by the welding machine is a traveling crane that can set the weldments in desired position and shift them as may be needed. It is planned to have at least two positioners spotted in the area served by the machine, but they too can be shifted by the crane as may be needed. As the positioners have rotary tables, they can rotate the weldment when circular welds are required, the welding head then remaining fixed.

Straight line welds with any number of passes required can be made either by traversing the track carriage (for welds parallel to the track) or by traversing the boom parallel to its horizontal axis regardless of the angle at which the boom may be set or of the height of the weld above the floor, as long as the weld-

Fig. 2. Multiple-torch flame cutting machine that automatically follows a template and can make square or bevel cuts on plates up to 14″ thick for use in HPM press weldments.

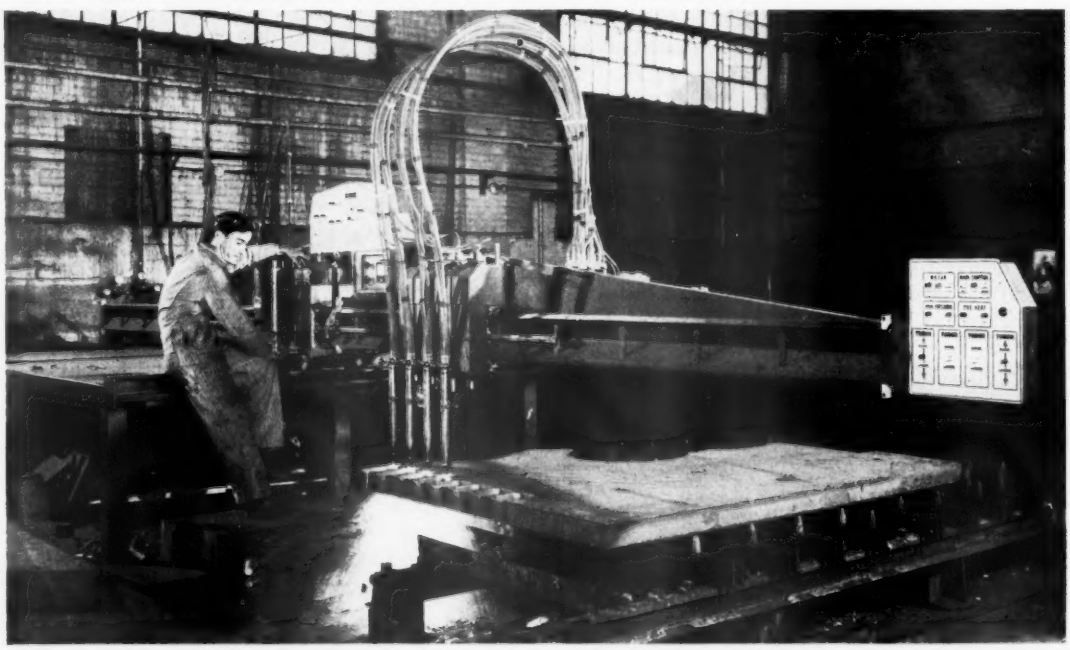


Fig. 3. Group of weldment blanks for HPM presses that have been cut by the machine shown in figure two. Many blanks are cut from much heavier plates.

ment is not too high for the boom to reach the required location.

Although Figure 1 shows only one reel for electrode wire, two reels and a dual head for feeding wire from both reels simultaneously can be used after changing the head's wire guides appropriately which is easily and quickly accomplished. Controls for the head are always adjacent to it and remote controls for adjusting the motion of the head relative to the work can be used.

Assemblies to be are normally set so that straight line welds will be parallel to the floor track or at right angles thereto; but, close positioning in such settings is not required because of the variety of adjustments provided on the machine and the ability to set the boom at whatever transverse position is needed for a given weld.

Normally, the machine is used to make external welds; but, it can be used for some internal welds, say on box sections, if the workpiece can be suitably positioned and clearances are sufficient for the head and boom to enter and be traversed as required.

A suction system for picking up excess unfused flux, cleaning it and feeding it to the head hopper is provided, though not shown in Figure 1. It is not mounted permanently on the welding machine but can be so installed as to be applied where needed, although the head hopper may be kept filled by hand when this is more convenient than rigging an automatic feed to the hopper.

As HPM hydraulic presses are mostly heavy machines and many weldments have to be made from heavy plate, good flame cutting equipment —including that for beveling edges where deep welds must be made—is required. A new automatic gas cutting machine, Figure 2, has been added. It can cut four blanks simultaneously when their size comes within bed and plate limits. Torches follow the template automatically.

Plates up to 14" thick are readily cut on this new machine, and efforts are made to schedule the cutting so that the very heavy plates will require a minimum of shifting. Cutting is also planned to leave a minimum of scrap. Figure 3 shows a batch of blanks stacked after cutting, although this group does not include any blanks above 2½" in thickness. Additional equipment is available to cut plates up to 25" or more in thickness.

QUALITY CONTROL - -

a feature of multiple nut runners

Fig. 1. A nine-motor nut runner used in tightening nuts on an automobile transmission case cover (test setup).

QUALITY CONTROL in multiple fastener assembly operations is an important advantage to be derived from the use of multiple nut runners.

It is easy to visualize an assembly job in which two mating parts are to be fastened together by running nuts down on bolts or studs.

Assuming that a workpiece calls for 12 nuts placed in a circular pattern to be run down to a specified torque, it is questionable whether it will be more satisfactory to tighten the nuts one at a time in rotation around the pattern or to criss-cross the workpiece and alternately tighten the nuts on opposite sides of the assembly.

It is possible that slight tilting action of the top member might take place as the first nut is run down to the pre-set torque value. As the last nut is set, the uncertainty is whether the assembled parts are uniformly seated.

However, this uncertainty is eliminated by use of a multiple nut runner on a job of this kind. By using a six-spindle machine on a 12-nut assembly, six alternate nuts are run down simultaneously, and by indexing the machine the remaining six nuts are tightened.

Performing the operation in this manner, a uniform seating of the mating surfaces of the assembly is ensured and all nuts are tightened to the same torque. In addition to this Quality Control feature, it is readily realized that two nut tightening operations is less time-consuming than twelve and therefore promises a worthwhile reduction in production costs.

In the design of a multiple nut runner, the number of nuts to be run determines the number of air motors that will be required, since a motor is required for each nut to be run. The pattern of the nut locations determines the arrangement of the motors in the machine.

Some of the many multiple nut runners used in the automotive industry are illustrated.

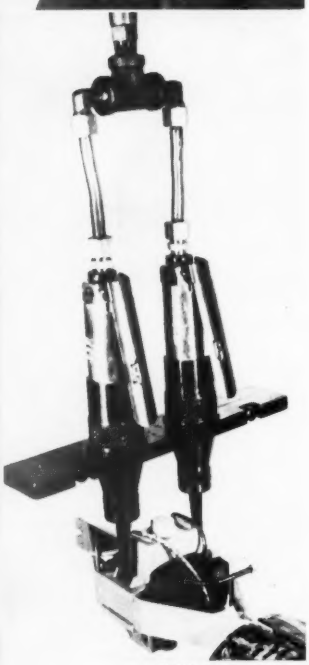


Fig. 2. (Left) It was important that the two assembly screws on this electrical component be pulled down together. To accomplish this, the two air-powered screw drivers with trigger controls were assembled as shown for accurate spacing. Fig. 3. (Below) External view of a nine-motor nut runner for assembling torque converters on one of the popular make automobiles. It runs nine cap screws in a single operation. The 18 cap screws in the bolt circle are driven in two operations. This machine weighs 130 lbs and measures 25 5/8" in over-all height.

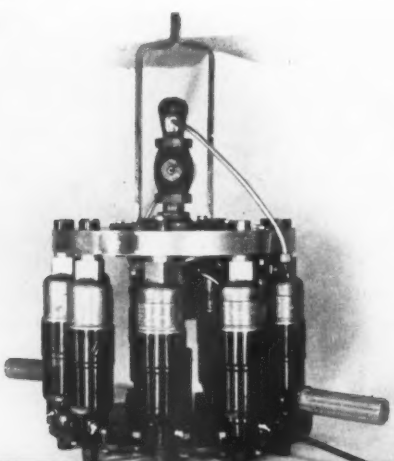
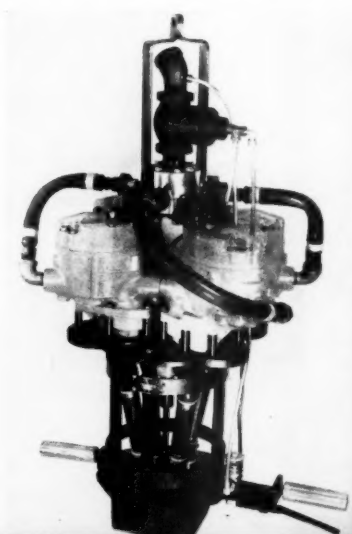


Fig. 4. This four-motor nut runner was designed for applying rear spring U-Bolt nuts. Drawing down all nuts at once makes the job easier, faster and better. The machines weigh 202 lbs and measure 42 1/4" in over-all height.

Photos courtesy Ingersoll-Rand Co.



TERNSTEDT PROMOTES SPEED AND SAFETY IN DIE CASTING

All machines have gates that close and open automatically. Dies cannot close until safety block is raised. Non-inflammable solution of soluble oil is used in the hot end of hydraulic circuit.

MANY STEPS LOOKING toward greater speed and safety in producing zinc alloy die castings have been taken in recent years in one of the Detroit plants of the Ternstedt Division, General Motors Corporation. This plant boasts one of the largest departments devoted exclusively to producing zinc alloy die castings to be found in industry. About 100,000 lbs of zinc alloy is converted daily into parts classed as "hardware" for General Motors cars and trucks.

Their die casting machines are equipped to run on automatic cycles that are started by pressing a button. This includes not only closing and locking the dies, making the "shots" and opening the dies but, in most cases, automatic ejection of castings. In some cases, an automatic arrangement for lifting an entire gate of castings out of the machine is used.

All machines are equipped with sheet steel sliding doors, Figure 1, that cover the die on top as well as on both sides of the machine. In most instances, these doors are air operated and engage limit switches only when fully closed. Only when these switches are actuated can the shot be made. The doors completely protect the operator as well as others who may be near the machine in case the die should spit hot metal; yet, as the door next to the operator always opens as the die opens, the operator can inspect the interior of the die, apply lubricant when needed, and remove the casting.

Certain machines are also arranged so that a block, suspended from a counterbalanced lever, drops between the die halves when they

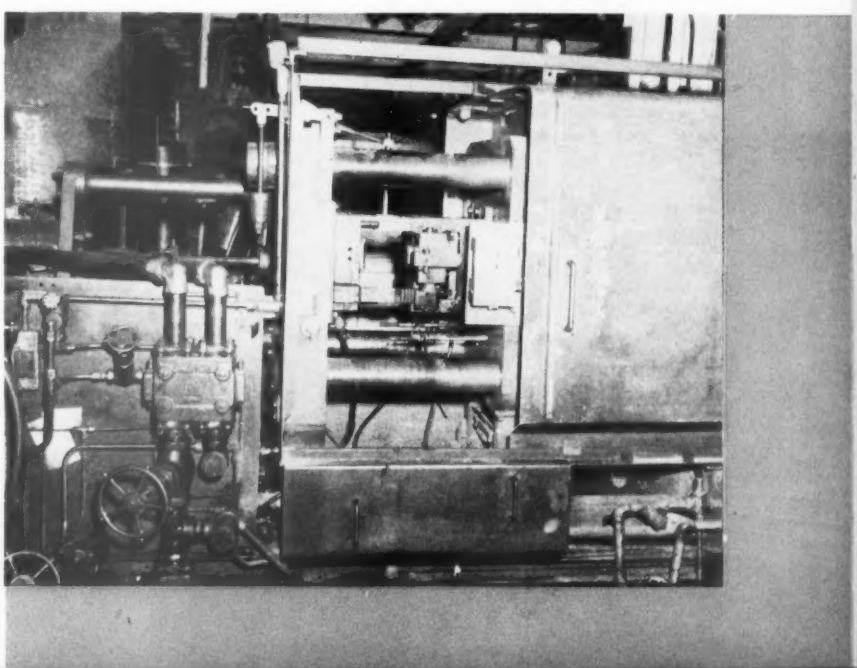


Fig. 1. Casting machine equipped with sliding doors which must be fully closed before the machine will run through its automatic cycle. Also shown is a safety block that is lowered between die halves as the die opens. Thus the die cannot be closed until the block is elevated, which is done automatically when the machine doors are fully closed.

open up and remains there until the door next to the operator closes. This makes it impossible to close the die accidentally when the machine operator or setup man is working on the die, again promoting safety.

Some machines apply as much as a 600-ton locking pressure to prevent the die from opening when metal is injected as well as to insure the specified dimensional limits on castings. This same pressure is applied, of course, to the die box located between the die and the rear platen of the machine. Formerly, these boxes were made of cast iron that was subject to deflection under the heavy pressure. Today, these boxes are either of cast steel or are made from heavy wrought steel components welded together. Such boxes are better able to resist the high pressures applied and do not deflect significantly under the high pressure. Thereby, safety is further promoted.

All machines are now self-contained units having their own high pressure pumps and other hydraulic equipment that operate and lock the dies and also provide pressure for injecting the molten metal. This avoids using a central hydraulic system with piping to several machines and also makes each machine independent of the others. Hydraulic metal injection is preferred to air injection, partly because the speed of injection is readily controlled.

In many shops, the entire hydraulic system is filled with mineral oil, partly because such oil is a lubricant and helps to reduce wear on pumps and other moving parts. If a leak occurs, especially one near the furnace at the hot end of a machine, the oil may be ignited and a serious fire may result.

To avoid this hazard, Ternstedt has its latest machines arranged so that mineral oil is used only at the cold ends, where pumps are located. A "slave" cylinder, visible in Figure 2, and using a non-inflammable mixture containing about 95% water and 5% soluble oil, is interposed between a mineral oil cylinder at the cold end and the cylinder for operating the metal injecting plunger at the hot end. Accordingly, this slave cylinder and the one for metal injection, as well as the piping between, use only the non-inflammable oil and should a leak occur no fire is likely, even though the fluid should reach the furnace or molten metal.

Although the oil-water mixture is not the best lubricant, it has sufficient lubricating value to avoid excessive wear on pistons, rods and moving valve parts. At upper center in Figure 2 there appears a small tank with gage glass. It holds a reserve of the soluble oil mixture that can be fed into the hot end hydraulic system when any loss from leakage occurs.

Most exterior door handles die cast in this shop at one time required casting around steel inserts. Special dies equipped with magazine feeds for the inserts were used to help shorten the casting cycle. Besides having to make and handle the inserts, they had to be recovered from rejects and occasionally got into remelt pots where precautions must be taken to avoid iron pickup. Present practice has eliminated the inserts by redesign of the door handles. This avoids the troubles formerly arising from the use of steel inserts and promotes more rapid production.

These safety and time saving factors are not exclusive with Ternstedt and are not the only ones employed. Those mentioned, however, have shown favorable results and are in line with a policy which favors innovations that help to promote safety and, when possible, increase output with less fatigue for operators.

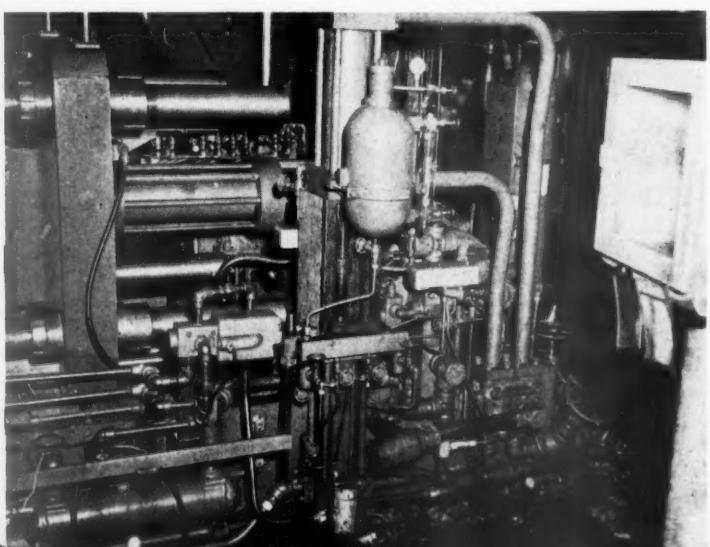


Fig. 2. Portion of a die casting machine showing the oil filled hydraulic system at the cold end. This circuitry includes a slave cylinder filled with a non-inflammable water-soluble oil mixture that serves only the hot end including the hydraulic injection elements.

ULTRASONICS

A New Approach to Sinking Mold & Die Cavities

Figure 1

by David C. Kauffman
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PREVIOUS ISSUES OF **TOOLING and PRODUCTION** have described the Cavitron ultrasonic machining process and how it works (see T & P of July, 1953 and February, 1953).

This process offers an entirely new approach to the sinking of cavity molds, embossing dies, engravings, marking dies, trimming dies, shaped punches, and many similar items.

The engraving and hand finishing of cavities or the hobbing and cold working of molds can now be eliminated in favor of this process which can, in a matter of minutes or a few hours, produce any shaped cavity to close tolerances and fine finishes.

Of major interest is the ability to produce cavities in hard "unmachinable" materials such as tungsten carbide and hardened steel. Sapphire dies can also be made in a matter of minutes to any shape.

In order to make a typical cavity (Fig. 1). two or three or four tools are required. The number of tools is based upon the depth of the cavity, the finish and the tolerance required. The engraved tool, soldered to the tool-holder, is attached to the machine. The die workpiece is properly located beneath the tool and the tool is lowered against the die. A light spring or weight forces the tool gently against the die to maintain penetration. A dial indicator shows the amount of penetration.

The tool — pressing lightly against the workpiece — is set into vibration with a working stroke of .002″ to .004″ at a rate of 25,000 times a second. At the same time a slurry of boron carbide abrasive grit is flowed around the tool. The vibrating tool impacts the grit against the workpiece millions of times a minute. This grit then rapidly cuts out the die cavity in an exact duplicate of the tool.

After about 10 to 20 minutes of machining, the die may be penetrated from .060″ to .100″. By this time the tool has probably lost .003″ to .030″ of its size due to wear. The hard workpiece is chipped away up to 10 times more rapidly than the tool which is made of soft steel. The harder and more brittle the work-

Photo courtesy The Sheffield Corp.

Machining operations on brittle or extremely hard materials can be performed on the Sheffield Cavitron ultrasonic machine tool — designed for extreme accuracy, versatility, and simplicity of operation.

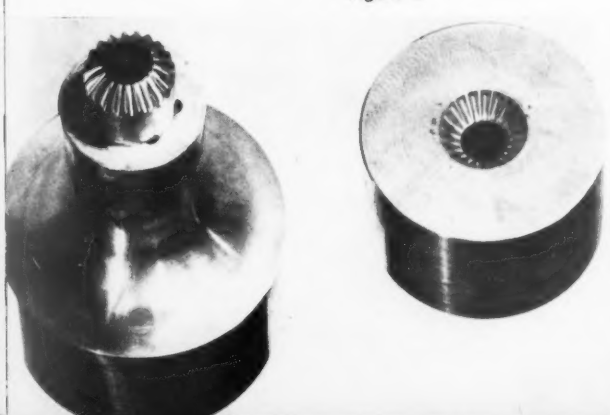
Figure 2

piece, the faster it will machine.

The tool-holder is then removed and is replaced by another one containing a new tool. This tool sinks into the roughed-out cavity and the cycle starts over again. An additional .010″ to .030″ is removed in about five minutes and the workpiece cavity is brought back to sharpness and size, closely following the contour or shape of the tool. Usually, 240-grit abrasive is used for this operation.

The tool-holder and tool are then replaced with another new tool. The workpiece is then washed with copper sulphate to coat the working surface of the die with copper. Another cycle is started and the workpiece is machined for an additional .003″ to .010″ of depth. Examination of the workpiece will show if all the copper plating is removed, indicating that the entire form is now exactly the same as the tool.

Figure 3



This operation may only take two minutes. Usually 400-grit boron carbide abrasive is used.

At this point the workpiece cavity may be finished. However, if the part is critical and extreme accuracy or fine finishes are required, another cycle may be needed.

Up to this point the tool has been from .003″ to .004″ smaller than the required shape of the cavity. This is to allow for the grit opening the cavity a slight amount. For the final extra finishing operation whenever .0002″ or .0005″ tolerances may be required, (for example, on the Nylon gear, Fig. 2a) the total should be only .001″ smaller than the required cavity. A 600- or 800-grit abrasive is then used. Machining time may take only a few seconds or up to one minute.

Figure 4

Note that if more than one cavity is required, the tools used on the second, third and fourth operations of the first die can be used in the first, second and third operations of the second die.

There have been very many instances when production parts themselves are used for tools. Take, for example, the angle spline die (Fig. 3); here a cold formed cotton picker part is brazed onto the tool-holder and used to make a finished die. Another method of preparing tools has been to reduce their size by etching in acid or electro-stripping (deplating), or to increase their size by plating.

The surfaces of cavities made with the Cavitron ultrasonic process lend themselves to be easily finished to one or two micro-inches with a little hand lapping. Many dies today must be made by segmentation because of their critical shapes or close tolerances. This, of course, can be eliminated by the preparation of proper tooling and machining by Cavitron from one solid piece.

Questions may arise as to the scope of the Cavitron machine. Existing machines of 500-watt output have a capacity up to about 1 ½" diameter. Machines are becoming available for work at capacities up to 2" or 3" diameter. These will be 2400-watt units. Usually a cavity depth of up to one inch is practical.

It is not usually necessary to preform or rough out cavities when using the ultrasonic process. Sometimes, when working on large cavities, preforming or roughing operations may be useful.

On several occasions, large, intricate and expensive gages, fixtures or dies have been salvaged by auxiliary shaping or repairing. Engineering changes can also be incorporated into dies by machining them in the hard state with Cavitron.

Drawing dies are ideally suited for either initial manufacture or opening to larger sizes with Cavitron ultrasonic process drilling. Round dies are usually opened up by conventional turning with diamond nibs and lapping. Ultrasonics can perform this operation in a matter of 10 to 30 minutes depending on size. Where dies are NOT round it may take up to 10 hours to open the die by conventional methods. The ultrasonic process can open these dies also in 10 to 30 minutes.

For example, the drawing die shown in Figure 4 was opened from .246" x .363" to .261" x .405" in a total of one hour machining time. This included opening the bearing surface, the approach angle, the entrance angle, and the relief angle at the bottom of the die.

The carbide crimping die shown in Figure 5 (right) was formed in 45 minutes, using the tool (left) made from cold-rolled steel. The tool is the exact required die details, but in reverse.

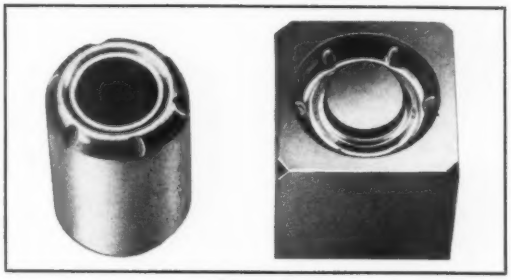


Figure 5

The coining die shown in Figure 2j is made from a stamped coin. New tools for making this die could have been made from an original carving by either electro-forming in nickel or by precision casting. This die is made in about one hour of machining time.

Of major importance to industry is the fact that dies and other tooling that cannot possibly be made in carbide with today's conventional techniques can be made very easily with the Cavitron process. For example, the "locomotive" jewelry die (Fig. 2f) and the "G.E." stamp (Fig. 2d) are both made in carbide. These tools took from 30 minutes to one hour to complete.

The internal threads shown in Figure 2e is another application in carbide which took about one hour. The marking die, Figure 2h, was sunk into carbide for a depth of .020" in two minutes.

The Phillips heading punch of carbide was made from regular Phillip head screws as forming tools and took about one hour and 15 minutes.

Figure 2g shows a sample embossing die and a slot head screw punch in carbide. Figure 2b is a blanking die section in carbide, which was held to .0005".

All of the dies described plus others were made by our Cavitron Products Division.

In operation of the ultrasonic machine tool, the tool head is lowered so as to vibrate at high frequency against the workpiece, while a slurry of boron carbide abrasive is flowed around the tool.

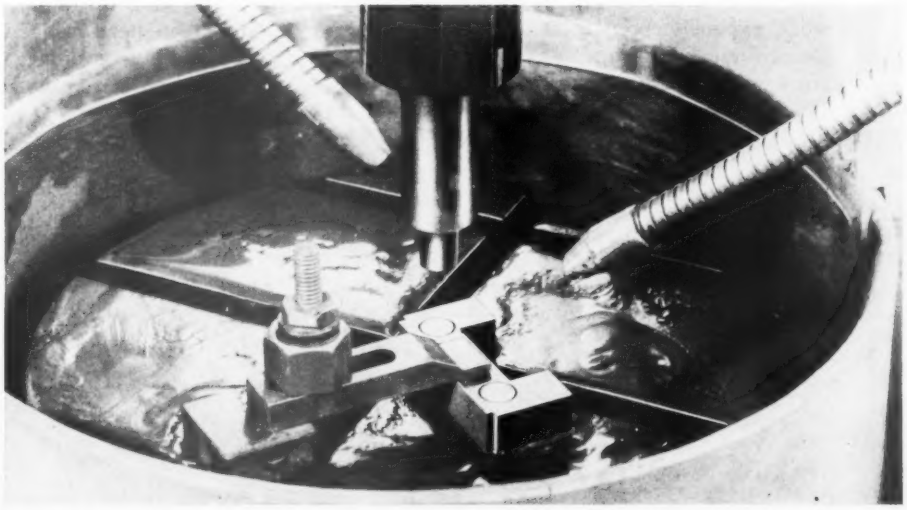


Photo courtesy
The Sheffield Corp.

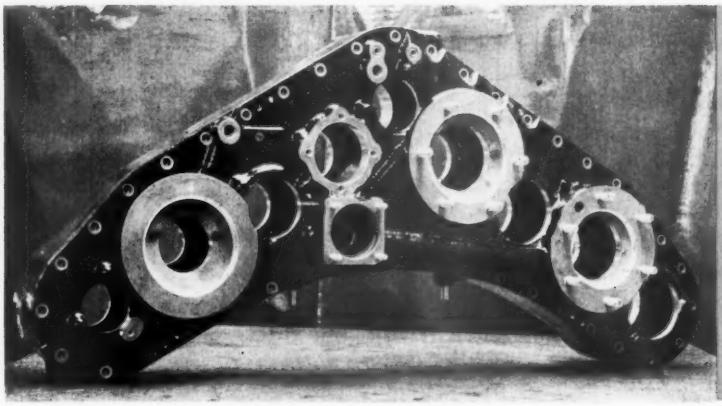


Fig. 1. Large magnesium gear casing. The studs are driven with a torque tool into holes with class 3 threads tapped on these machines. The tapped holes around the outside edge receive Helicoil inserts.

Photos courtesy Beckett-Harcum Company, Inc.

AIR POWERED TAPPERS REDUCE REJECTS

by W. C. Hunter
Vice President
J. LEUKART MACHINE CO., INC.
Columbus, Ohio

PRECISION TAPPING at the J. Leukart Machine Co., Inc. is an operation which determines the difference between acceptance or rejection of expensive aircraft parts. The company has been specializing in the production of precision aircraft components for several years; and, more and more, tapping to close tolerances became a major problem.

The quantities involved varied from five or ten pieces to many thousands, and the need for an economical yet flexible means of precision tapping was a real problem.

After a search for equipment with the characteristics to meet our needs, a line of Beckett-Harcum air powered drilling and tapping machines was installed, for the reason that they had most of the features and flexibility necessary to our operation.

Not only are the basic parts with which we work expensive, but most of them are completely machined and anodized before the holes are tapped; therefore, rejections are a major source of concern to us. We were gratified to find an immediate reduction in rejects when this equipment was put into operation.

A survey of rejections on a typical part revealed that before the use of these drilling and tapping machines, rejections were about 12%. After installing the tappers, rejections were cut to less than one-half of one percent.

Although these facts seem startling, there are many concrete reasons for the improvement.

First of all: once the tap has entered the work when using an air powered reversible motor tapping machine of this type, there is practically no lineal force on the tap. This provides a "floating" lineal motion while providing the necessary torque for cutting the thread. The combination of these two means that the tap can enter a **tapped hole** without

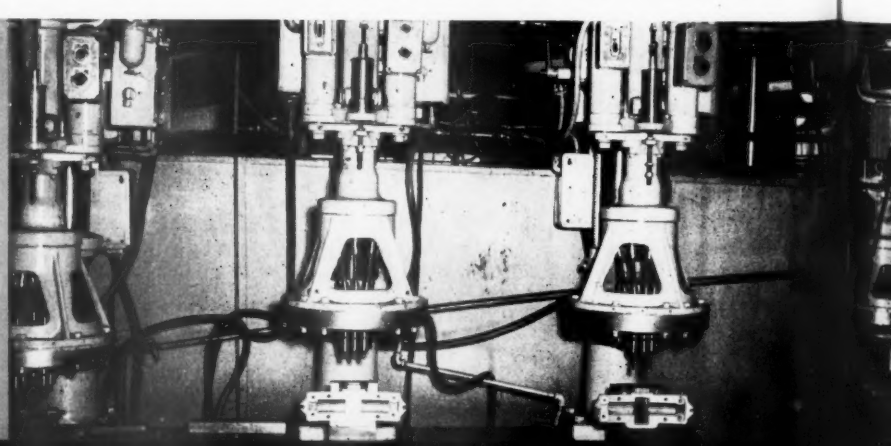


Fig. 2. Magnesium housings loaded in "lay in fixtures" for countersinking and tapping operations.

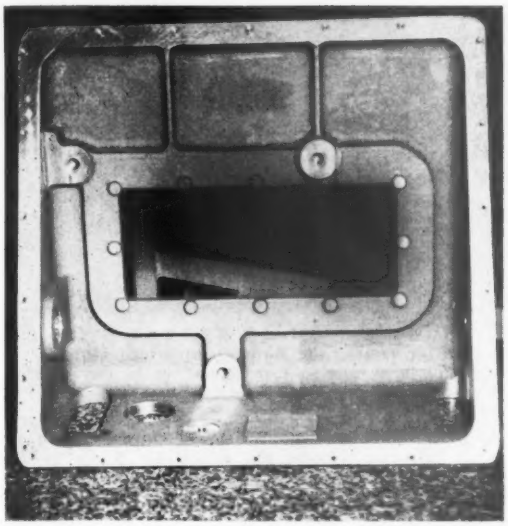


Fig. 3. Aluminum case with 22 holes drilled and tapped with 10-24, class 3 threads around the sealing face.

Fig. 4. Drilling 12 holes in an aluminum port. Two passes are made with a 6-spindle multiple drill head mounted on a standard Beckett air powered drilling and tapping machine.

damage to the threads. It will simply "pick up" the lead and continue its cycle as if it were actually tapping the hole.

This characteristic has been extremely valuable to us for "cleaning up" tapped holes in ports that have to be tapped before they are anodized. Careful inspection has proven that the threads are not damaged in any way if the machine is set up properly.

This system is built around the idea of the tap being its own lead screw. The quality of the tapped hole therefore is almost entirely determined by the quality of the tap.

Tap life has been another source of savings. On a recent survey, we found that the abrasive action of magnesium had cut our tap life to an average of 200 holes per tap. This figure was increased to an average of 450 holes per tap when we installed Hi-cyclic air powered tappers to do this job.

Countersinking without expensive jigs proved a very simple matter. Instead of trying to locate from the hole, the part was allowed to float. Concentricity and depth were well within tolerance and the repeatability was excellent. When the countersink reached the work, it automatically centered the part from the hole itself—thus providing good concentricity.

We have found small hole tapping to be extremely economical on the Hi-cyclic air powered machines, and we have—in production—economically tapped magnesium parts with holes up to ¾ - 10 and ¾ - 16.

Titanium parts with tapped holes up to ¼ - 28 have been successfully processed on these machines. Here, one rejected part represents as much as $3,500.00 loss in time and material; so, we cannot afford to take chances on any unproved method of tapping.

Our experiences over the past five years with Hi-cyclic controls have convinced us that this method of tapping is economical, flexible, and above all of a quality which is a must in our field.

The cost of maintenance is virtually nil and our setups require very little time.

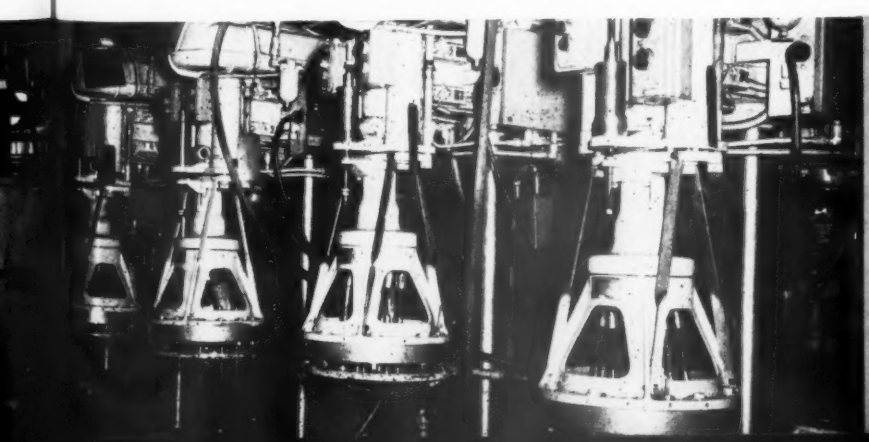
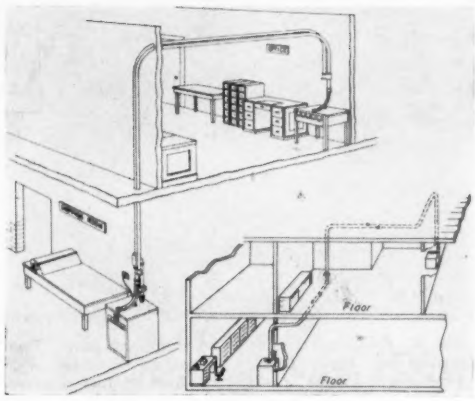


Fig. 5. Line of Beckett air powered drilling and tapping machines equipped with Commander multiple spindle heads used for drilling, reaming, countersinking, and tapping.

Pneumatic Tubes Speed In-Plant Communications*



Photos courtesy Lamson Corp.

Fig. 1. (right) the Airtube system can be assembled into a variety of configurations to link points in different rooms or different floors.

TRANSMITTAL OF MESSAGES and paper work by messenger on fixed schedules or by office personnel, which diverts them from their normal work, can be a problem in offices and industrial plants.

A solution to such a problem lies in a pneumatic tube system which comes as a packaged, prefabricated two-station set.

The system is pre-engineered so that the user can lay out and install the equipment in any type building by regular maintenance personnel. It is a two-way system connecting points up to 130′ apart that will transmit paper work speedily, economically, and conveniently.

It can be installed in a variety of configurations to connect points on either the same or different floor levels.

Messages and other paper work are moved through the tubes in air-propelled carriers at a speed of 20′ per sec. Carriers may be sent as often as four every 10 sec.—so that, in an 8-hr day, the Airtube system can handle more than 1400 round trips between two stations.

Included in the kit are expanded end steel tubing, bends, terminal valves, receiving chutes, all hardware needed for assembling and installing the equipment, message carriers, and a cabinet unit containing a ½-hp motor and exhauster to create the air system.

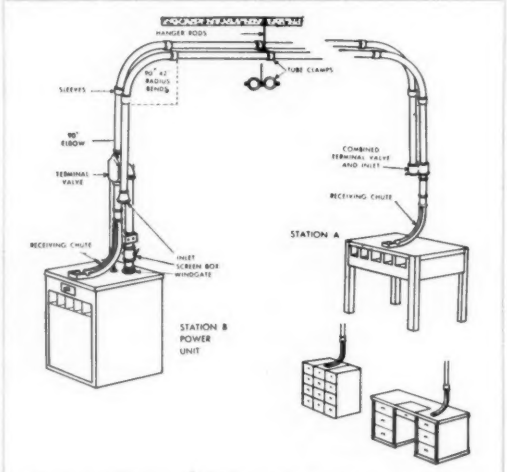


Fig. 2. The components supplied in the prefabricated Airtube kit.

*See Tooling & Production, Sept. '54, p. 136; Dec. '54, p. 59.

New 12″ Lathe Series Announced

The built-in countershafts on the "5300" Series 12″ Clausing lathes have a friction clutch and brake that permit instant starts and stops of the headstock spindle without stopping the motor. The brakeshoe is self-aligning and floating, with full surface breaking for maximum efficiency. The expanding-type clutch has a long-wearing bonded band.

Twelve speeds, from 29 rpm to 1300 rpm, are obtainable on the "5300's", six direct and six backgeared for heavy duty service. Feeds range from 0.00065″ to 0.037″.

The spindle is made of forged, precision-ground steel, 16″ long, with a 1⅜″ bore and 1″ collet capacity. Tool post, ring, and rocker are made of heat-treated alloy steel. The tool post slot on these lathes takes ½″ tool bits or a holder for 5/16″ bits. Distance between centers on the various models is 24″, 36″, and 48″.

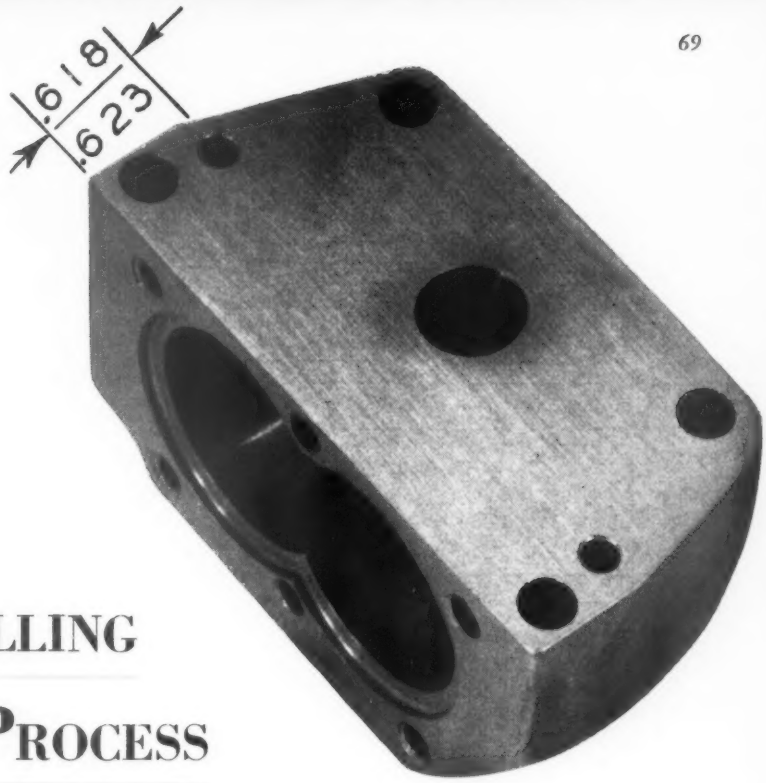


Fig. 1. The dimension (0.618"-0.623"), from one face of this pump body to the centerline of a drilled hole became difficult to hold within the 0.005" specified tolerance. It is the subject of the investigation related in this article.

A Four Step Plan For Controlling Quality in Process

by Michael P. Agresta,
SQC Engineer, Pesco Products Division, BORG-WARNER CORPORATION, Cleveland, Ohio

ONE OF THE MOST useful tools in any statistical quality control program is a good sound workable system of in-process control. If any benefits are to be reaped by acceptance sampling inspection, process control must be maintained. The minimizing of scrap and costs of rework within an organization plus the general quality status of manufactured parts can best be obtained by control of in-process work. So it can be summarized and again repeated that in-process control is a very vital phase in obtaining and maintaining a good control on quality. How then is such an important element incorporated in a manufacturing process? This article will attempt to show how Pesco Products set up their system of in-process control. Pesco, like many other plants throughout the country, is the type of organization that machines thousands upon thousands of different types of parts but in relatively small quantities. Because of this, the particular plan here presented was established. The Pesco in-process plan is broken down into four steps. These steps are summarized and later explained in detail as follows:

Step No. 1—Maintaining the History Records on Parts
Step No. 2—Inspection and Recording of Data
Step No. 3—Plotting and Analysis of Data
Step No. 4—Follow through for Corrective Action

Step No. 1 — Maintaining the History Records on Parts

The statistical quality control office which consists of the SQC Engineer, two analysts, a clerk typist, and two posting clerks is the receiving center for all paper work pertaining to the quality of parts produced. The maintaining of a good set of records was one of the primary requisites in establishing our system.

Before any type of record is established it should be planned carefully in respect to the type of data needed and how it is to be obtained. For example, in setting up our scrap and rework tickets, it was necessary to write detailed instructions and have short informal meetings of all the necessary personnel to explain all the why's and wherefore's. Any data worth having is worth the little extra time and effort involved for explaining how it is to be obtained properly and accurately. In addition to the scrap and rework it became necessary

Total Fraction Defective (G) = $\frac{\Sigma C + \Sigma D + \Sigma E + \Sigma F + \Sigma J}{\Sigma C + \Sigma D + \Sigma E + \Sigma H + \Sigma J + \Sigma K}$

Fraction Scrap (L) = $\frac{\Sigma C + \Sigma D + \Sigma E + \Sigma H + \Sigma J}{\Sigma C + \Sigma D + \Sigma E + \Sigma H + \Sigma J + \Sigma K}$

Pesco

PRODUCTS DIVISION
BORG-WARNER CORPORATION

INSPECTION RECORD CARD

PART NO. X-Y-Z

PART NAME—**BODY Card # 2**

A	B	C	D	E	F	G		H	I	J	K	L
Last Complete Operation	Material Release 816	Dimen. Scrap 57	Set Up & Reset Scrap	Mach. Scrap	Rej. To M.R.B. 40	Tot. Frac. Def.	DESCRIPTION OF DEFECTS & VENDORS	DATE 1953	Quantity Scrapped By M.R.B.	Vendor Scrap 16	Scrapped In Assembly	Quan. Acc. In Final Stk. 881	Fraction Scrap
120/53		1					Excess Snagging - Thin Wall	2-13					
							@ 9/32 Hole						
200/27		2					Drilled Holes off Loc.	2-13					
180/25		4					[redacted] .618 - .623 ¢ dim u/s [redacted]	2-13					
230/23		22					(21) .6875 - .688 I.D. o/s	2-13					
							(1) T.M. in same						
180/25		1					Deep Tool Mark on Face	2-13					
FIN/30		1					Crooked at Assy.	2-14					
FIN/63		6					Damaged in Handling	2-14					
Vendor							Insuf. stock in .688 Bore	2-15		1	*		
Vendor							Blow Hole on face			1	*		
Vendor							(1) o/s core opening (2) Core shift			3	*		
	816	94			40		FEB. TOTALS			21		881	
180/25					57		[redacted] .618 - .623 ¢ dim u/s [redacted]	3-2	20				
Vendor							Porous cstg. - Sand Holes	3-5		1	*		
Vendor							Coreshift	3-19		2	*		
					57		MAR. TOTALS		20	3			
120/53		3					Excess Snagging - Thin Wall	4-2					
	225	*						4-10				5	
185/12		1					Drill Holes Broke Thru Side Wall	4-9					
210/27			1				Setup	4-10					
230/23			5				Setup	4-16					
220/22		1					1.250 - 1.2505 I.D. o/s	4-20					
220/22					5		1.250 - 1.2505 I.D. o/s	4-20				349	
120/53		9					Excess Snagging - Thin Wall	4-23					
							@ 9/32 Hole						
120/53		1					Excess Snagging - Thin Wall	4-24					
							@ 9/32 Hole						
110/53		2					Excess Snagging in Rough	4-24					
	425	*					Core Port Extends into Gear Pocket	4-25		5	*	257	
	650	17	6		5		APR. TOTALS			5		611	

*(X-FOUNDRY)

Fig. 2-a. The Inspection Record card provides for a re-cap of all data from scrap and rework tickets. It shows how a study can be made of a troublesome dimension, in this case the 0.618"-0.623" dim. from the edge of the part to the centerline of a drilled hole as indicated in Figure 1. This is the #2 card of 5 cards used in the study on this operation. The figures shown in the column head spaces, are the quantities carried over from card #1.

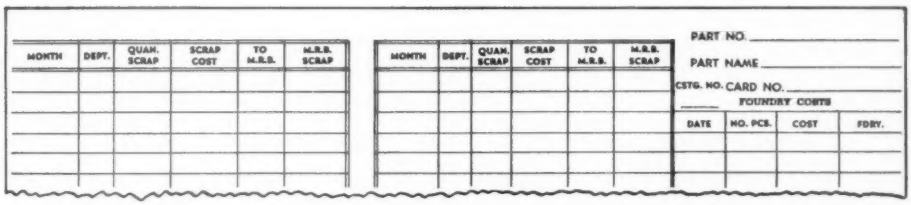


Fig. 2-b. The back of the Inspection Record card provides a monthly report on the part being investigated.

to obtain data and make out forms or tickets for material going into stock, final inspection results, receiving and shipping data, laboratory checks, test results, cost figures, vendor and foundry reports, material releases, and so on. When we reached a point where more refinement was needed in our analysis we delved into time study surveys, efficiency reports, routings and operational sheets, tools and gages, service and customer reports, etc. In order to prevent a mass accumulation of miscellaneous data, individual cards per part were made to consolidate most of the information contained in the various forms and tickets. After a very short time a systematic routine was established whereby, the complete history of any part could be had by merely pulling a card from the file. For example, our SQC inspection record card shown in Figure 2-a provides space for recording all the data on the scrap and rework tickets, (i. e. part number and name, department and operation number responsible, description of discrepancy, and date), amount of material released to production, foundry discrepancies, amount of pieces entering finish stock, and all Material Review Board action. The backs of these cards Figure 2-b, are used to post the monthly scrap costs by production departments. In addition to the SQC inspection record card the final inspection stations are provided with check lists for checking various parts. These check lists show the critical dimensions requiring 100% inspection, the major dimensions requiring a tight sample check, and the minor dimensions requiring a loose inspection. The results of each lot checked in final inspection is turned into the SQC office daily for analysis and posting.

Step No. 2 — Inspection and Recording of Data

From the various records maintained in the SQC office an index, shown in Figure 3, is compiled covering all the troublesome dimensions of a repetitive nature. Four sets of indexes are maintained—three for the shop and one in the SQC office. Only the parts and dimensions listed on the index cards are checked by the process inspectors assigned to SQC. When the jobs listed in the index hit the floor, the process inspector checks and records on the survey worksheet, Figure 4-a, the results of his inspections. Since the SQC process inspector restricts his checking only to dimensions listed on the index, he is able to check a good sized sample on 2, 3, or 4 jobs daily. By way of comparison a regular floor inspector will only check 2 or 3 pieces per machine and be required to cover anywhere from 20 to 35 machines. The purpose of the index is to eliminate all jobs and dimensions with a very good history, thereby, allowing all the extra time to be spent on repetitive troublesome jobs. Any comment or suggestion pertaining to the job from the inspector, operator, setup man, or foreman is also recorded on the in-process worksheet. Special care is taken to make sure that the proper person receives credit and due consideration for any worthwhile suggestion. All worksheets are turned into the SQC office daily for analysis.

Step No. 3 — Plotting and Analysis of Data

All worksheets turned into the SQC office are carefully analyzed and the 6 sigma spread, based on an $\bar{R}_{max.}$ factor and known as the process capability, is determined. These computations are speeded up considerably by pre-

Fig. 3. This S.Q.C. process card gives the inspector those operations which require special attention.

XY-5300-2

S.Q.C. PROCESS INDEX

PART NAME Body PART NO. X-Y-Z

DEPT.	Oper.#	DIMENSIONS	CODE
53	110 &120	Excess Snagging	
25	180	.618-.623 Dim.	
23	230	.6875-.688 I.D.	

S.Q.C. IN-PROCESS WORK SHEETS

DATA: CODE: -1σ .617
DEPT 25 OPER NO. 180 0σ .618
DIM. .618 - .623 Centerline Dim. +1σ .619

PART NO. X-Y-Z
PART NAME Body
FIXTURE NO. T-9021 DATE 10/9/53
MACHINE NO. 721-10 INSPECTOR PLAVCHAN (MIKE)
GAGE Jo-Blocks

Group #	1	2	3	4	5	SUM	AVG.	RANGE
	+7	+4 1/2	+6	+6	+4	27.5	5.5	3
	+3	+4	+3	+4	+3	17.	3.4	1
	+5	+6	+3	+1	+6	21.	4.2	5
	+7	+3 1/2	+3	+4	+4	21.5	4.3	4
	+4	+7	+5 1/2	+4 1/2	+4 1/2	25.5	5.1	3
	+6	+6	+5	+4	+4	25.	5.0	2
	+4 1/2	+3	+4	+5	+5	21.5	4.3	2
	+5	+6	+6	+5	+1	23.	4.6	5
	+1	0	+2	+1	+2	6.	1.2	2
	+1	+3	+3 1/2	+3 1/2	-1	10.	2.0	4.5
	+1 1/2							
TAPER ☐	O/R ☐		OTHER ☐					

COMMENTS

MIKE

After study of oper. #180 it was noticed that on some pcs. milled locating surface does not make full contact with locating buttons. Size varies due to vibration when milling cutter hits heavy stock. Would it be possible for you to view this job in operation?

Alex.

Memo written 10-19-53

PROCESS CAPABILITY = 6σ = .008 $\bar{x}$ = 3.88 $\bar{R}$ = 4.0 $\Sigma\bar{x}$ = 31.5 $\Sigma\bar{R}$ = 3.1

(See Back Side for Chart) RY-3100-3

Fig. 4-a. The S.Q.C. inspector records the results of his inspection on this In-Process worksheet. From his tabulations the process capability on the operation is computed.

computed tables, Figure 5, used to determine the 6 sigma spread. The term process capability as used here means that the present setup which includes such variables as operator, tooling and fixtures, and machine, has a certain spread or range which will include 99% of the lot.

An even simpler explanation would be that the actual spread or tolerance to be expected of the given setup, including the variables just mentioned, is the figure known as the process capability. The backs of the sheets, Figure 4-b are plotted and graphed showing the actual distribution and the percentage of the lot that is expected to fall above or below tolerance. Comparing worksheets on the same job from both day and night shifts can eliminate or pin point the source of trouble as to operator or human element. If the operator is eliminated, it then boils down to tooling and fixtures, or machine. Further processing for elimination can weed out or pin point the machine. In addition to the capabilities, the comments on the worksheets are studied and investigated for possible use in obtaining corrective action. Many times the comments or suggestions from the inspector, foreman, setup man, or operator are evidence enough for corrective measures on a troublesome item.

Step No. 4 — Follow Through for Corrective Action

After the data has been collected and the analysis made the SQC engineer summarizes all the information and writes an inter-office memo to the superintendent stating the results of the survey and whenever possible trys to pinpoint the exact source of trouble. The superintendent turns this memo over to either his trouble shooter, methods or standards, engineering, or whomever he thinks can get the corrective action. When action has been taken he writes an inter-office memo to the SQC engineer stating the nature of the corrective action and the cycle is completed. In the event that no memo is received by the SQC engineer after a reasonable length of time he in turn

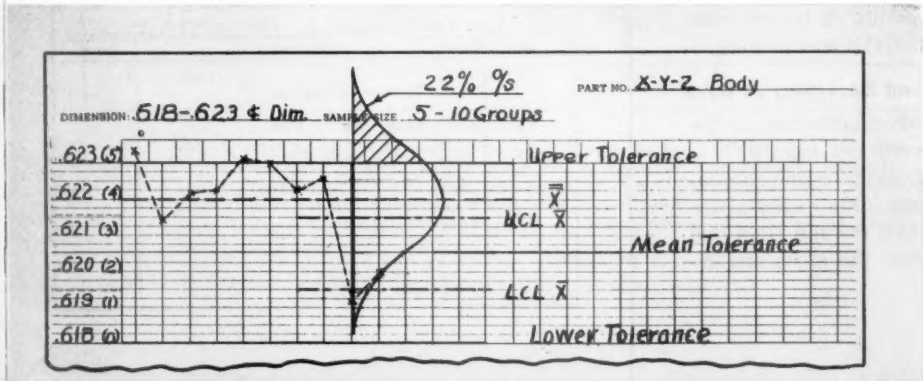


Fig. 4-b. The graph and curve quickly tell what can be expected in the lot from the operation as it is being run at present. Corrective action is required as indicated by the curve which shows that 22% will be oversize.

writes a follow-up memo to the vice president/works manager stating that a particular job has been surveyed and written and no action has been taken to date.

As a practical example of how the system works, an actual case-history of a troublesome dimension is shown stating all the steps from the history cards to the final corrective action taken.

Practical Example

The actual case in question was the X-Y-Z pump body. By following the card, Figure 2-a, we can see a detailed description of the various discrepancies on this particular part. This is the second of 5 cards on this part for the year 1953. Reading down the card it can be seen that on Feb. 13, there was one piece scrapped from operation No. 120, Dept. 53, because of excess snagging, thereby, leaving a thin wall at the 9/32" bolt holes. On Feb. 13, there were two pieces scrapped from operation No. 200, Dept. 27, because of drilled holes being off location. Again on Feb. 13, there were four pieces scrapped from operation No. 180, Dept. 25, because the 0.618-0.623 centerline dimension was undersize. Continuing in this manner with each line, we come to the February totals which show that on this particular part number for the month, we had the following results: There were 816 castings released to production from X-Foundry, 94 pieces scrapped dimensionally, 40 pieces entered the material review board (MRB), 21 pieces of foundry or vendor scrap, and 881 good pieces went into finish stock. On March 2, we had 57 pieces entering MRB from operation No. 180, Dept. 25, because of the 0.618-0.623 centerline dimension being undersize. After the MRB reviewed these pieces they decided to scrap 20 and accept 37 of them. Thus we can see how a history on various dimensions can be obtained. In this particular case there were three dimensions that were repetitively troublesome. These dimensions are listed on the index cards, Figure 3, and act as a guide for the SQC inspectors. It is only these particular dimensions that we are anxious to determine the cause of the discrepancy. Since we are citing only one particular example we will concern ourselves only

SQC PROCESS CAPABILITIES FOR SAMPLE OF 5

$\bar{R}$	Proc. Cap.	$\bar{R}$	Proc. Cap.	$\bar{R}$	Proc. Cap.	$\bar{R}$	Proc. Cap.	$\bar{R}$	Proc. Cap.
1.	2.58	2.8	7.22	4.6	11.87	6.4	16.51	8.2	21.16
1.1	2.84	2.9	7.48	4.7	12.13	6.5	16.77	8.3	21.41
1.2	3.1	3.	7.74	4.8	12.38	6.6	17.03	8.4	21.67
1.3	3.35	3.1	8.0	4.9	12.64	6.7	17.29	8.5	21.93
1.4	3.61	3.2	8.26	5.	12.90	6.8	17.54	8.6	22.19
1.5	3.87	3.3	8.51	5.1	13.16	6.9	17.80	8.7	22.45
1.6	4.13	3.4	8.77	5.2	13.42	7.	18.06	8.8	22.70
1.7	4.39	3.5	9.03	5.3	13.67	7.1	18.32	8.9	22.96
1.8	4.64	3.6	9.29	5.4	13.93	7.2	18.58	9.	23.22
1.9	4.90	3.7	9.55	5.5	14.19	7.3	18.83	9.1	23.48
2.	5.16	3.8	9.80	5.6	14.45	7.4	19.09	9.2	23.74
2.1	5.42	3.9	10.06	5.7	14.71	7.5	19.35	9.3	23.99
2.2	5.68	4.	10.32	5.8	14.96	7.6	19.61	9.4	24.25
2.3	5.93	4.1	10.58	5.9	15.22	7.7	19.87	9.5	24.51
2.4	6.19	4.2	10.84	6.	15.48	7.8	20.12	9.6	24.77
2.5	6.45	4.3	11.09	6.1	15.74	7.9	20.38	9.7	25.03
2.6	6.71	4.4	11.35	6.2	16.0	8.	20.64	9.8	25.28
2.7	6.97	4.5	11.61	6.3	16.25	8.1	20.90	9.9	25.54

Fig. 5. This table was computed to speed up the processing of the worksheet data thereby making the process capability of an operation readily available.

FORMULA FOR COMPUTING PROCESS CAPABILITY

$$\sigma' = \frac{\bar{R}}{d_2}, \text{ Since } \frac{6\bar{R}}{d_2} = \text{Process Cap., Then Proc. Cap.} = \bar{R}\left(\frac{6}{d_2}\right)$$

For samples of 5, $d_2 = 2.326$ & $\frac{6}{d_2} = 2.58$, $\therefore$ Proc. Cap. $= \bar{R} \times (2.58)$

NOTE: PROC. CAP. FOR IN BETWEEN NUMBERS OF $\bar{R}$ CAN BE OBTAINED BY INTERPOLATION.

PROVISIONAL CONTROL LIMITS FOR SAMPLES OF 5

Tot. Tol.	Scale	$\bar{R}_{max}$	$A_2\bar{R}_{max}$	$D_4\bar{R}_{max}$	Tot. Tol.	Scale	$\bar{R}_{max}$	$A_2\bar{R}_{max}$	$D_4\bar{R}_{max}$
.0003	.00005	.00012	.00007	.00025	.0051	.0004	.00199	.00115	.00420
.0004	.00005	.00016	.00009	.00034	.0052	.0004	.00203	.00118	.00428
.0005	.00005	.0002	.00012	.00042	.0053	.0004	.00207	.0012	.00436
.0006	.00005	.00023	.00013	.00049	.0054	.0004	.00211	.00122	.00445
.0007	.00005	.00027	.00016	.00057	.0055	.0004	.00215	.00125	.00454
.0008	.00005	.00031	.00018	.00065	.0056	.0004	.00218	.00126	.00461
.0009	.00005	.00035	.0002	.00074	.0057	.0004	.00222	.00129	.00469
.001	.0001	.00039	.00023	.00082	.0058	.0004	.00226	.00131	.00477
.0011	.0001	.00043	.00025	.00091	.0059	.0004	.00230	.00133	.00485
.0012	.0001	.00047	.00027	.00099	.006	.0004	.00234	.00136	.00494
.0013	.0001	.00051	.0003	.00108	.0061	.0005	.00238	.00138	.00503
.0014	.0001	.00055	.00032	.00116	.0062	.0005	.00242	.00140	.00511
.0015	.0001	.00059	.00034	.00124	.0063	.0005	.00246	.00143	.00519
.0016	.0001	.00062	.00036	.00131	.0064	.0005	.00250	.00145	.00527
.0017	.0001	.00066	.00038	.00139	.0065	.0005	.00254	.00147	.00535
.0018	.0001	.00070	.00041	.00148	.0066	.0005	.00257	.00149	.00543
.0019	.0001	.00074	.00043	.00156	.0067	.0005	.00261	.00151	.00551
.002	.0001	.00078	.00045	.00165	.0068	.0005	.00265	.00154	.00559
.0021	.0002	.00082	.00048	.00173	.0069	.0005	.00269	.00156	.00567
.0022	.0002	.00086	.0005	.00181	.007	.0005	.00273	.00158	.00576
.0023	.0002	.00090	.00052	.00190	.0071	.0005	.00277	.00161	.00585
.0024	.0002	.00094	.00055	.00198	.0072	.0005	.00281	.00163	.00594
.0025	.0002	.00098	.00057	.00207	.0073	.0005	.00285	.00165	.00601
.0026	.0002	.00101	.00059	.00213	.0074	.0005	.00289	.00168	.00610
.0027	.0002	.00105	.00061	.00222	.0075	.0005	.00293	.0017	.00618
.0028	.0002	.00109	.00063	.00230	.0076	.0005	.00296	.00173	.00625
.0029	.0002	.00113	.00066	.00238	.0077	.0005	.0030	.00174	.00633
.003	.0002	.00117	.00068	.00247	.0078	.0005	.00304	.00176	.00641
.0031	.0004	.00121	.0007	.00255	.0079	.0005	.00306	.00179	.00650
.0032	.0004	.00125	.00073	.00264	.008	.0005	.00312	.00181	.00658
.0033	.0004	.00129	.00075	.00272	.0081	.001	.00316	.00183	.00666
.0034	.0004	.00133	.00077	.00281	.0082	.001	.00320	.00186	.00675
.0035	.0004	.00137	.00079	.00289	.0083	.001	.00324	.00188	.00684
.0036	.0004	.00140	.00081	.00296	.0084	.001	.00328	.0019	.00692
.0037	.0004	.00144	.00084	.00304	.0085	.001	.00332	.00193	.0070
.0038	.0004	.00148	.00086	.00312	.0086	.001	.00335	.00194	.00707
.0039	.0004	.00152	.00088	.00320	.0087	.001	.00339	.00197	.00715
.004	.0004	.00156	.0009	.00329	.0088	.001	.00343	.00199	.00723
.0041	.0004	.00160	.00093	.00338	.0089	.001	.00347	.00201	.00732
.0042	.0004	.00164	.00095	.00346	.009	.001	.00351	.00204	.00741
.0043	.0004	.00168	.00097	.00354	.0091	.001	.00355	.00206	.00749
.0044	.0004	.00172	.001	.00363	.0092	.001	.00359	.00208	.00757
.0045	.0004	.00176	.00102	.00371	.0093	.001	.00363	.00211	.00765
.0046	.0004	.00179	.00104	.00378	.0094	.001	.00367	.00213	.00774
.0047	.0004	.00183	.00106	.00386	.0095	.001	.00371	.00215	.00783
.0048	.0004	.00187	.00108	.00394	.0096	.001	.00374	.00217	.00790
.0049	.0004	.00191	.00111	.00403	.0097	.001	.00378	.00219	.00798
.005	.0004	.00195	.00113	.00411	.0098	.001	.00382	.00222	.00805
					.0099	.001	.00386	.00224	.00814
					.010	.001	.0039	.00226	.00823
					.020	.002	.0078	.00452	.01646

PRODUCTS DIVISION
BORG-WARNER CORPORATION

STATISTICAL QUALITY CONTROL AIDS

FACTORS FOR COMPUTING 3-SIGMA CONTROL LIMITS

Sample Size	A_2	D_3	D_4
2	1.880	0	3.268
3	1.023	0	2.574
4	.729	0	2.282
5	.577	0	2.114
6	.483	0	2.004
7	.419	.076	1.924
8	.373	.136	1.864
9	.337	.184	1.816
10	.308	.223	1.777
11	.285	.256	1.744
12	.266	.284	1.717
13	.249	.308	1.692
14	.235	.329	1.671
15	.223	.348	1.652

PROVISIONAL CONTROL LIMITS

Provisional control limits use the print tolerance as a basis.

$\bar{R}_{max} = \frac{d_2}{6}$ times (Total Tolerance)

$UCL_{\bar{x}}$ = Tol. Mean + $A_2\bar{R}_{max}$

$LCL_{\bar{x}}$ = Tol. Mean - $A_2\bar{R}_{max}$

$UCL_R = D_4\bar{R}_{max}$

FACTORS FOR DETERMINING $\bar{R}_{max}$

Sample Size (n)	Factor d_2	$d_2/6$
2	1.128	.188 or .19
3	1.693	.282 or .28
4	2.059	.343 or .34
5	2.326	.388 or .39
6	2.534	.422 or .42
7	2.704	.451 or .45
8	2.847	.475 or .48
9	2.970	.495 or .50
10	3.078	.513 or .51

FORMULAS FOR FINDING THE 3-SIGMA COMPUTED CONTROL LIMITS

$UCL_R = D_4\bar{R}$

$LCL_R = D_3\bar{R}$

$UCL_{\bar{x}} = \bar{\bar{x}} + A_2\bar{R}$

$LCL_{\bar{x}} = \bar{\bar{x}} - A_2\bar{R}$

FORMULAS FOR FINDING THE 3-SIGMA CONTROL LIMITS FOR P CHARTS

$UCL_p = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$

$LCL_p = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$

FORMULAS FOR FINDING THE 3-SIGMA CONTROL LIMITS FOR np CHARTS

$UCL_{np} = n\bar{p} + 3\sqrt{n\bar{p}(1-\bar{p})}$

$LCL_{np} = n\bar{p} - 3\sqrt{n\bar{p}(1-\bar{p})}$

FORMULAS FOR FINDING THE 3-SIGMA CONTROL LIMITS FOR C CHARTS

$UCL_c = \bar{c} + 3\sqrt{\bar{c}}$

$LCL_c = \bar{c} - 3\sqrt{\bar{c}}$

PERCENT OF AREA UNDER THE NORMAL CURVE

± 1 sigma = 68 %

± 2 sigma = 95 %

± 3 sigma = 99.7%

Pesco Quality is a Standard Which Requires Your Best Work

Fig. 6-a. This table of provisional control limits for samples of 5 makes possible the rapid finding of values to be substituted in various formulas.

with the 0.618-0.623 centerline dimension from Dept. 25, operation No. 180.

When this particular job hit the floor there were two surveys taken. The one on the day shift showed a process capability of 0.019″ and the one on the night shift, Figure 4-a, showed a capability of 0.008″.

The average process capability for the two shifts was .014 on a 0.005″ blueprint tolerance. In analyzing the worksheets the SQC department first determined the capabilities on the basis of the given samples. A fast method of computing the capabilities is obtained by using the pre-computed tables for samples of 5, Figure 5. All that is necessary is to calculate the average range, $\bar{R}$, then follow this figure in the table to the process capabilities column to determine the 6 sigma spread or capability.

The process capability value of 0.008″ is calculated from gathered data shown in Figure 4-a. Five samples were inspected at ten intervals during the shift. The readings are in thousandths, plus or minus.

The sum of the plus readings in the 1st group is 27.5 and the average of these 5 readings is 5.5. The sum of the second group is 17 and the average 3.4. Thus the sum and average of each group is determined. The sum of these averages ($\Sigma\ \bar{X}$) is 39.6 and the average of these averages ($\bar{\bar{X}}$) is taken as 4.0.

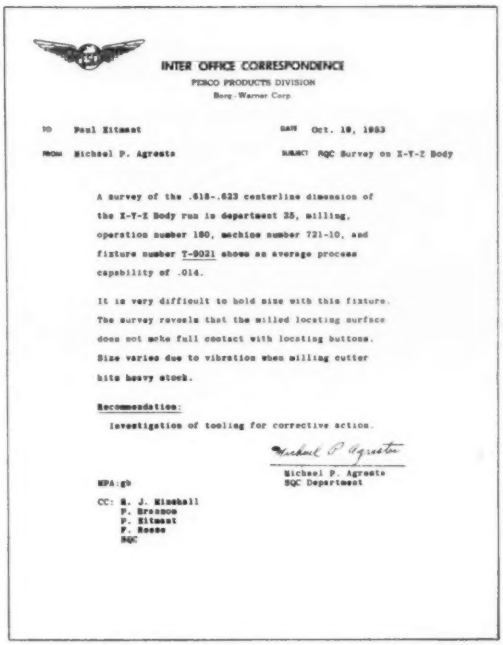
The range for a group of readings is the difference between the high and low readings. The high reading in the 1st group is 7, and the low 4. The range then is the difference which equals 3. In the 2nd group, the high is 4 and the low reading is 3. The range then equals 1. The range is determined for each group and the sum of them (Σ R) equals 31.5. The average range ($\bar{R}$) then is 3.1.

Referring to the $\bar{R}$ column in Figure 5, the value 3.1 is located and by following this line to the Proc. Cap. column, the value 8 is found, which in effect is .008″, since these values are computed in thousandths.

The formula used for computing the process capability values in the table, Figure 5, is included. The factor d_2 used in the formula is a constant and its value for samples of 5 is found in Figure 6-b., under the heading, "Factors for Determining $\bar{R}_{max}$". In this case d_2 = 2.326 for samples of 5.

Fig. 6-b. Formulas for determining various values in Quality Control investigations.

Fig. 7. The S.Q.C. engineer reports on an operation under investigation and requests corrective action.



INTER OFFICE CORRESPONDENCE

PESCO PRODUCTS DIVISION
Borg-Warner Corp.

TO Paul Eitmant DATE Oct. 18, 1953

FROM Michael P. Agresta SUBJECT SQC Survey on X-Y-Z Body

A survey of the .618-.623 centerline dimension of the X-Y-Z Body run in department 25, milling, operation number 180, machine number 721-10, and fixture number T-9021 shows an average process capability of .014.

It is very difficult to hold size with this fixture. The survey reveals that the milled locating surface does not make full contact with locating buttons. Size varies due to vibration when milling cutter hits heavy stock.

Recommendation:

Investigation of tooling for corrective action.

Michael P. Agresta
Michael P. Agresta
SQC Department

MPA:gb

CC: R. J. Minshall
P. Brennon
P. Eitmant
F. Reese
SQC

The comments from the night shift were very interesting and the actual observance showed that the trouble did lie in the contacting of locating buttons as called out in the worksheet comments by the SQC inspector. On the back of the worksheet, Figure 4-b, the actual distribution was plotted showing the spread to be expected of the lot.

In plotting the graph the values used are the averages of the sums from Figure 4-a. The ordinates are in terms of 0.001″ and the abscissa in group numbers.

Lines representing the upper and lower tolerances (0.618″-0.623″), the average of averages ($\overline{\overline{X}} = 4$), upper control limit ($UCL_{\bar{x}} = 0.62163''$), lower control limit ($LCL_{\bar{x}} = 0.61937''$), and mean tolerance (0.62050″) are drawn in on the graph.

The $UCL_{\bar{x}}$ and $LCL_{\bar{x}}$ values are derived from the formulas shown in Figure 6-b under Provisional Control limits.

$$UCL_{\bar{x}} = \text{Tol. mean} + A_2 \bar{R}_{max}$$
$$= 0.62050'' + 0.00113''$$
$$= 0.62163''$$

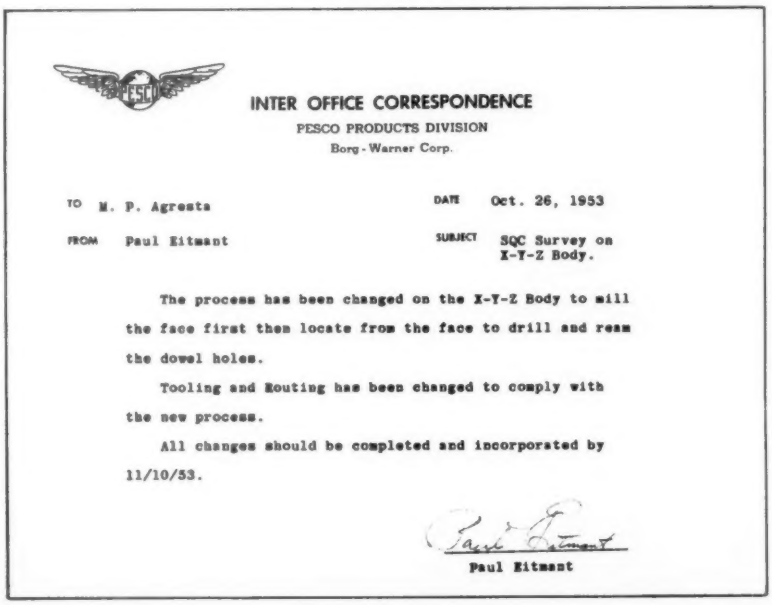
Since the total tolerance is 0.005″ then $A_2\bar{R}_{max}$ is found under this column heading in Figure 6-a in line with the 0.005″ value, which is 0.00113″.

$$LCL_{\bar{x}} = \text{Tol mean} - A_2 R_{max}$$
$$= 0.6205'' - 0.00113''$$
$$= 0.61937$$

It can be seen from this particular spread that 22% of the lot will fall over the high limit.

The memo to the superintendent, Figure 7, stated the nature of the discrepancy and recommended an investigation of the tooling for corrective action. The reply, Figure 8, shows that the process was changed and the necessary corrective action taken. History on this particular part showed that there were no more discrepancies on this centerline dimension after the change in process.

Fig. 8. The report on the completion of corrective action taken on an operation under investigation.



INTER OFFICE CORRESPONDENCE

PESCO PRODUCTS DIVISION
Borg-Warner Corp.

TO M. P. Agresta DATE Oct. 26, 1953

FROM Paul Eitmant SUBJECT SQC Survey on X-Y-Z Body.

The process has been changed on the X-Y-Z Body to mill the face first then locate from the face to drill and ream the dowel holes.

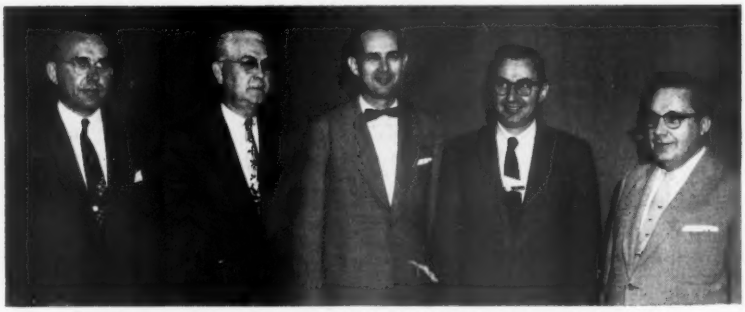
Tooling and Routing has been changed to comply with the new process.

All changes should be completed and incorporated by 11/10/53.

Paul Eitmant
Paul Eitmant

ELECTION RETURNS . . . .

N.T.D.M.A.



NTDMA officers for 1954-55 (left to right): Philip R. Marsilius, Treasurer; Joseph N. Huser, First Vice-President; Jerome H. Stanek, President; Herbert Harig, Second Vice-President; Harold G. Murdock, Secretary.

The ninth annual convention of the National Tool & Die Manufacturers Association, held recently in Dayton, Ohio, included election of officers for the 1954-55 year.

Jerome H. Stanek, vice-president of Stanek Tool & Manufacturing Company, Milwaukee is the new President of the association. The office of First Vice-President is held by Joseph N. Huser, president of B & H Specialty Co., Inc., Indianapolis, with Herbert Harig, vice-president of Harig Manufacturing Corp., Chicago, serving as Second Vice-President. The 1954-55 Treasurer (re-elected) is Philip R. Marsilius, vice-president of The Producto Machine Co., Bridgeport, Conn. Harold G. Murdock, the new Secretary, is vice-president of Arrowsmith Tool & Die Corporation, Los Angeles.

George S. Eaton continues as NTDMA's Executive Secretary with Charles R. Bender as Assistant Secretary. The national offices of the association are in Cleveland.

Among the features of the four-day program were plant tours of The Sheffield Corp. and the Cincinnati Milling Machine Co.

—— • ——

N.M.T.B.A.

At the 53rd Annual Meeting of the National Machine Tool Builders' Association held in White Sulphur Springs, W. Va., elections were held for 1955 officers and three board directorates.

Milburn A. Hollengreen, president, Landis Tool Company, Waynesboro, Pa., is the new association President.

Louis Polk, president, the Sheffield Corporation, Dayton, Ohio, was elected First Vice-President; and Jerome A. Raterman, president, Monarch Machine Tool Company, Sidney, Ohio, became Second Vice-President and a Director. John C. Cotner, president and general manager, Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, was re-elected Treasurer.

In addition to Mr. Raterman, newly elected members of the N.M.T.B.A. Board of Directors are: Henry D. Sharpe, Jr., president, Brown and Sharpe Manufacturing Company, Providence, R. I., and Perrin G. March, III, president, the Cincinnati Shaper Company, Cincinnati, Ohio.

Tell Berna was reappointed General Manager of the Association, and Mrs. Frida F. Selbert was re-elected Secretary.

("The Crystal Ball", an outstanding address made by the Association's 1954 President, Herbert L. Tigges, executive vice-president, Baker Brothers, Inc., Toledo, Ohio, appears in this issue, page 8, as our "Talk of the Month". E.W.P.)

MILBURN A. HOLLENGREEN
President

LOUIS POLK
First
Vice-President

JEROME A. RATERMAN
Second
Vice-President
and Director

JOHN C. COTNER
Treasurer

HENRY D. SHARPE, JR.
Director

PERRIN G. MARCH, III
Director

Everyone is talking about the NEW CINCINNATI TOOLMASTER MILLING MACHINE

Style 1B Toolmaster Milling Machine. Equipped with 1 hp spindle head; collet chuck type spindle nose, capacity ⅛" to 1" shank cutters; power feed to quill; worm positioning of swivel head.

CINCINNATI

Style 1B Toolmaster Milling Machine. Cincinnati rectangular overarm, square gibbed saddle-knee bearing, extra wide knee bearing on column face . . . these and other features constitute exceptionally sturdy construction for maximum hp cuts.

Meet the newest member of Cincinnati Milling's extensive line of machine tools . . . the Toolmaster. There are three styles of these sturdy toolroom milling machines:

1A—Manual feed to quill
1B—Power feed to quill
1C—Heavy duty spindle head

Toolmaster Milling Machines constitute a new opportunity to reduce costs in shops of all sizes; in toolrooms, metal pattern shops, contract machine shops, tool and die shops. You can depend upon any machine tool bearing the name plate of The Cincinnati Milling Machine Co. Would you like to know more about this new Toolmaster? Write for new four-color catalog, No. M-1870.

THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

Style 1C Toolmaster Milling Machine. Equipped with 2 hp heavy duty spindle head; built-in motor; 8 spindle speeds; No. 40 standard spindle nose.

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MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
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CIRCLE INFORM-A-GRAM KEY NO. 771

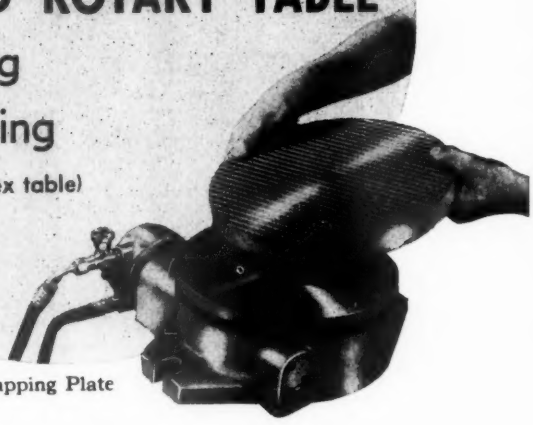
With Permanent Magnetic Chuck

NEW *Vulcan*

MOTORIZED ROTARY TABLE

for lapping and grinding

(not an index table)

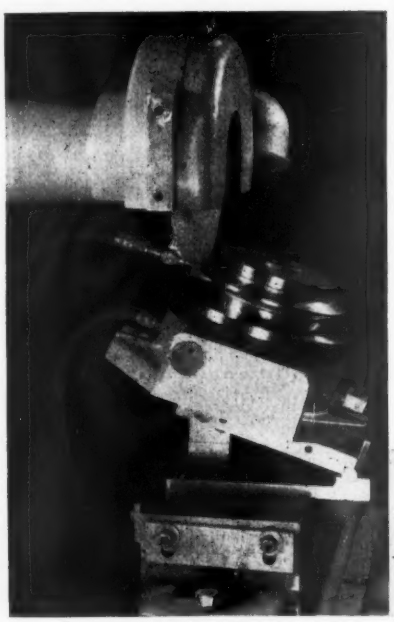


With Lapping Plate

FASTER
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.



Work clamped to motorized table, mounted on sine plate. Surface grinder application.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*

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Engineering, Processing, Designing and Building Special Tools . . . Dies . . . Special Machines . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size, Vulcanaire Jig Grinders, Plastic Tooling.

VULCAN TOOL CO.

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CIRCLE INFORM-A-GRAM KEY NO. 781

How To Simplify Stainless Steel Grinding

by John Clark, Jr.
Grinding Engineer
NORTON COMPANY
Worcester, Mass.

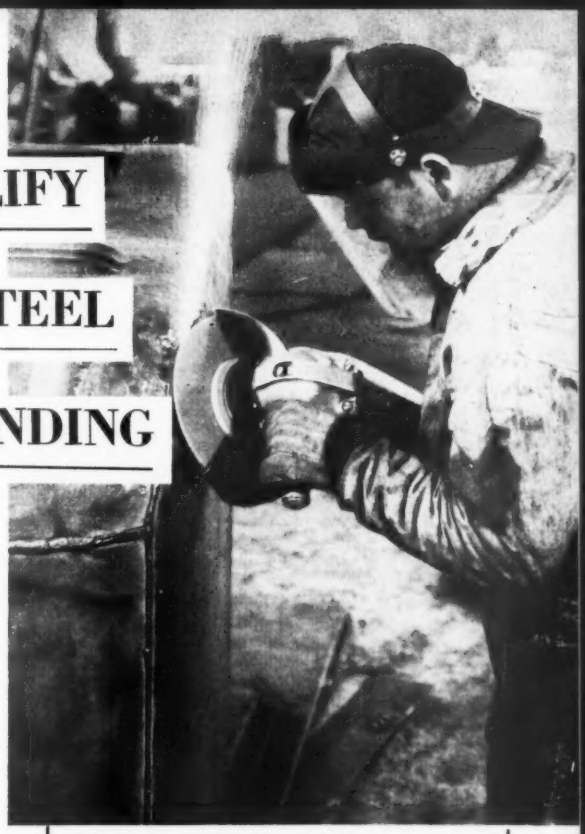


Fig 1. For cutting down stainless steel welds, reinforced resinoid hub type wheels are widely used.

STAINLESS STEEL need present no problem in grinding. Where trouble is encountered, it is usually because no thought was given to the type and grinding characteristics of the stainless steel.

There are three classifications of stainless steels. They are listed in Table I. The austenitic types, which take in the No. 300 series, we have called group A; the martensitic types in the No. 400 series, group B; and the ferritic types in the No. 400 series, group C.

The following differences in physical properties between the three types of stainless steels should be kept in mind in considering their grindability and wheels to use.

Austenitic stainless steels (group A) are nonmagnetic and are not hardenable by heat treatment. However, they can be hardened considerably by cold working.

Martensitic stainless steels (group B) are magnetic, and can be hardened by heat treatment.

Ferritic stainless steels (group C) are magnetic, and are not hardenable.

It will be evident that the easiest way to tell the No. 300 types of stainless steels from the No. 400 types is with a magnet. All of the No. 400 types (groups B and C) are magnetic; the No. 300 types (group A) are nonmagnetic.

Mr. Clark's article is from GRITS and GRINDS, Vol. 45, No. 8, copyright 1954 by Norton Company, and published here by kind permission.

Precision Grinding

When confronted with the problem of precision grinding stainless steel, the part should first be identified as to its type which, in turn, determines the group (A, B, or C) into which it falls. Then by referring to Table 2, the starting wheel specifications can be selected, according to the nature of the grinding operation.

Grinding Fluid All-Important

When grinding stainless steels of the group A or No. 300 series type, which are characteristically ductile and stringy, trouble is sometimes encountered from loading of the wheel face. This problem prompted a study by our research laboratories of the effects of different types and mixtures of grinding fluids or coolants. The results of these tests showed that conventional water-soluble grinding fluids are not very satisfactory for grinding the No. 300 types of stainless steels.

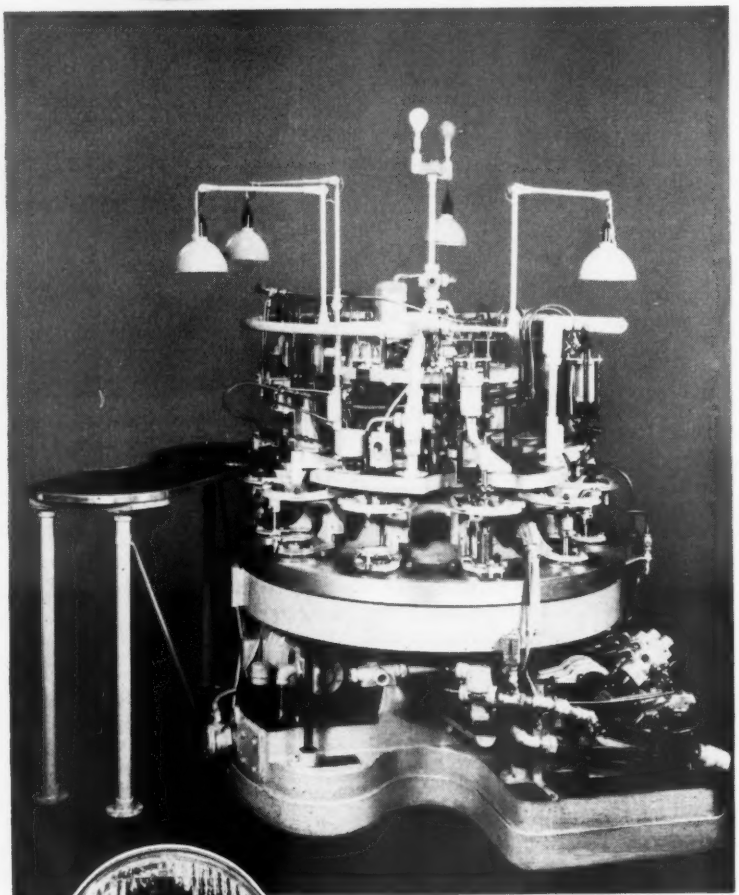
To overcome wheel loading, a highly detergent type of soluble oil should be used, and in somewhat higher concentration than normal. A mixture of one part oil to 20 parts water is recommended as a starting point.

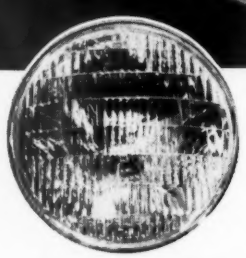
From the grinding standpoint, stainless steels in group C may be classed with the group A

. . . Continued on page 82

BARTH-BUILT 10-STATION INDEX TABLE MACHINE

speeds production of Sealed Beam Headlights!





1. Shapes and positions lead wires

2. Secures filament coils to lead wires

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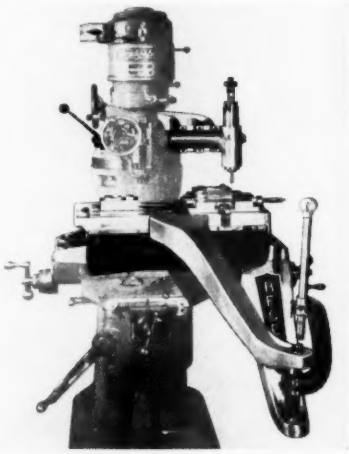
CIRCLE INFORM-A-GRAM KEY NO. 801

"Fluid Motion" Duplicator

Pictured here is a fast working, sensitively controlled duplicating device which in concept of design, construction and operation is so simple and effective that a relatively unskilled



operator can immediately go to work and turn out an accurate three-dimensional replica of a master pattern.

Known as the Regent Duplicator Table, it is currently available for all Bridgeport and Index (Model No. 55) vertical spindle milling machines. It has extensive application in the making of plastic, glass and rubber molds, as well as in many other duplicate machining operations calling for two- or three-dimensional profiling or contouring.

The duplicator consists of a 32″ x 15″ base which is secured to the miller table by four T-bolts, and which carries an auxiliary table of heavily ribbed aluminum alloy construction. This auxiliary table is free to move or "float" in a fully unrestrained manner on ball bearings running in two sets of hardened and ground raceways. Inasmuch as the two sets of raceways are at 90° to each other, the table can be traversed not only longitudinally and laterally but in any compounded angular direction between the two 90° coordinates.

The table, with a travel of 6″ x 6″, has a 12″ x 12″ work holding surface, and a master pattern or template holding surface of 10″ x 10″ with a 1″ x 1″ micrometer adjustment for precision location

. . . *Continued on page 92*

Microbore

STANDARD BORING BAR SETS for TURRET LATHES

Incorporating Micrometer Vernier Adjustable Tools

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Discuss your tooling problems with our Microbore specialists

CIRCLE INFORM-A-GRAM KEY NO. 811

. . . Stainless Steel Grinding, from page 79

Table 1. Types of Stainless Steels

Group A		*Group B*		*Group C*
AISI Type:		AISI Type:		AISI Type:
301	310	403	431	405
302	314			406
302B	316	410	440A	
303	317	414	440B	430
304	318	416	440C	430F
305		418	440F	
308	321			442
309		420		443
309S	347	420F		
309C	347F			446

stainless steels, and require the same precautions with respect to grinding fluid.

Try Alundum Wheel First

For precision grinding groups A and C stainless steels, two different wheel specifications are shown in Table 2 for each operation. In general, the lower priced ALUNDUM abrasive wheel listed first will do the job, assuming proper steps have been taken to safeguard against wheel loading by using a suitable, highly detergent soluble oil grinding fluid and in the right mixture.

If it is not convenient or practical to change to this special type of coolant, or if some wheel loading still persists after making this change, then the CRYSTOLON abrasive wheel listed as an alternative should be tried.

The group B stainless steels give relatively little trouble in grinding. In the hardened state, they grind very similar to ordinary steels for which regular soluble oil coolants in 1 to 50 mixtures usually are very satisfactory. ALUNDUM abrasive wheels, in either 19 or 32 ALUNDUM type and G vitrified bond, as used for conventional steel specifications work very satisfactorily on these group B stainless steels.

There are a few types of stainless steels in groups A and C which are unusually troublesome in grinding because of wheel loading. In these cases, where a highly detergent type of

. . . Continued on page 87

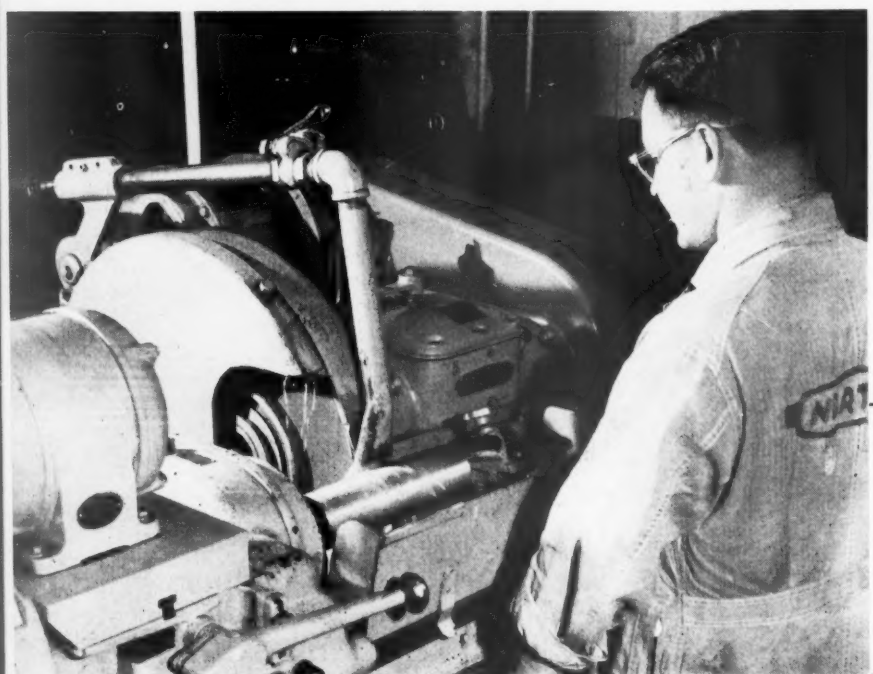
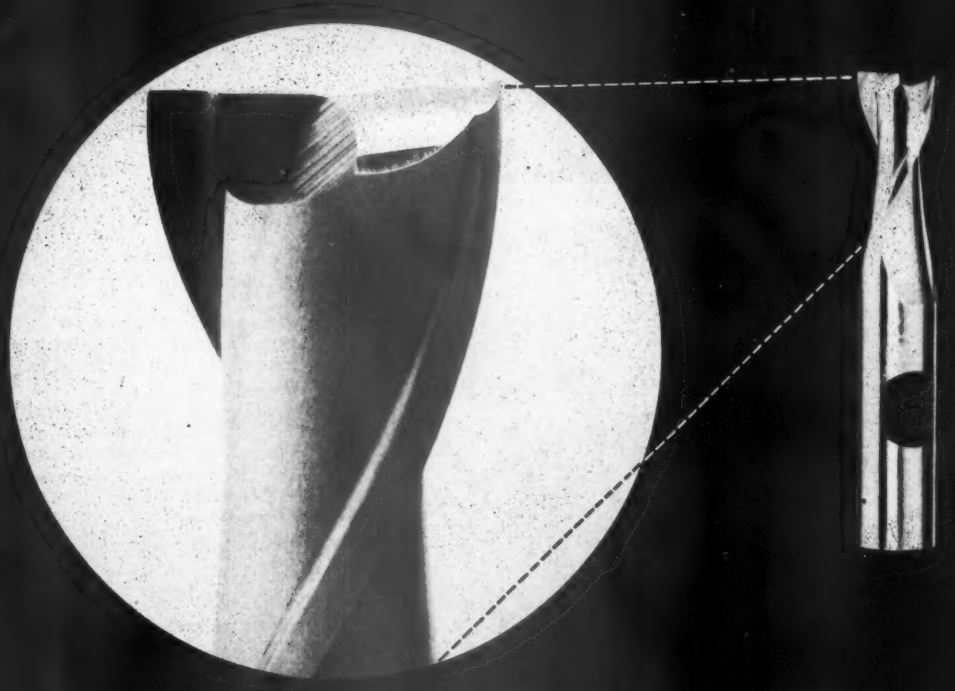


Fig. 2. After identifying this specimen of stainless steel as a No. 400 series, group B type, the operator selected a No. 19 ALUNDUM abrasive wheel, 19A46-L5VG.

Wadell Tools, the new leader in end cutting tools invites you to production test the "New Design" end mills.



Actual unretouched enlarged photograph of a stock "New Design" end mill.

"New Design" end mills are now setting production records and producing better finishes in some of the leading plants in the country.

Write for information and catalog.

BULOVA WATCH COMPANY, INC.

Putnam Plant
Flushing N. New York

November 19, 1954

Wadell Tool Company
P. O. Box 97
Raritan, New Jersey
Attention Mr. Wadell

Dear Sir:

Our first experience with Wadell end mills was an attempt to find a solution to an extremely difficult milling problem. It amazed everyone from engineering and supervision to the man at the machine the way the cutter stood up piece after piece on the formerly troublesome operation.

It was a gradual transition of Wadell cutters from this job to other difficult jobs to standardization for all jobs, outlasting other cutters as much as ten to one.

Everyone in our manufacturing division will heartily recommend Wadell end mills for dependability, finish, and ultimate economy.

Very truly yours,

G. Brunner, Mfg. Superintendent

GB/ez.

AMERICA RUNS ON BULOVA TIME

WT

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P. O. Box 97 • Raritan, New Jersey

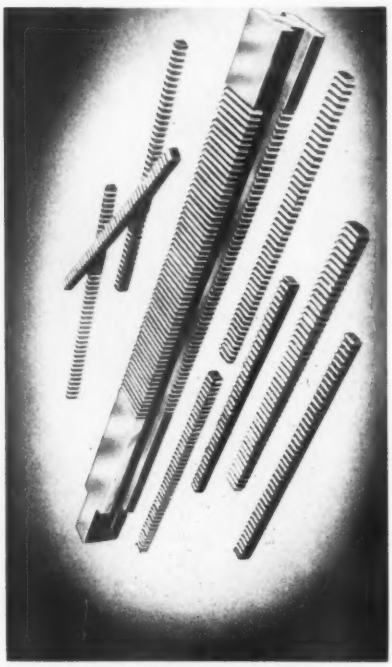
TERRITORIES AVAILABLE TO STOCKING MANUFACTURERS AGENTS

Ask your Diemaker !*

** We jumped from 16,000 to over 60,000 pieces per grind with*

Darwin **PRK • 33 TOOL STEEL**

This profit-making story from a Philadelphia Tool & Die Shop is what **you** can expect when you specify Darwin PRK-33 Tool Steel. Here's why! By adding Cobalt to Darwin PRK-33, a secondary hardness is achieved which makes the improved and hardened steel ideal for tools and dies which must undergo long runs at high temperatures. In addition, PRK-33 Cobaltcrom is one of the few steels which **grind super-keen** as well as being unsurpassed for dies which require a perfect edge for eliminating flash. No wonder **the expert diemakers** look to PRK-33 when they want to increase die life and reduce regrinds! So why not call or write for information on the complete line of Darwin Tool Steels today! You'll be money ahead!



Broach dies of PRK-33 Cobaltcrom Steel

Complete line of highest grade Tool Steels, including PRK-33, DARWIN No. 1, NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Billet and Sand Casting, Drill Rod, Flat Ground Stock and Tool Bits. Bulletin on Request.

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CIRCLE INFORM-A-GRAM KEY NO. 841

Tom G. Winterton

It is with the deepest regret that we note the passing of Tom G. Winterton, who died November 15 after a brief illness.

A graduate of Duquesne University, Mr. Winterton was with the United States Steel Corporation from 1928 to 1951 when he became manager of advertising and sales promotion for the Latrobe Steel Company, Latrobe, Pa.

Tom put in two Navy years during World War II and was an active member of both the National Industrial Advertisers Association and the American Marketing Association. He contributed much of his time and publicity skills to Latrobe civic affairs.

— E. W. P. and Staff.

"Oct-O-Pus" Loads Presses

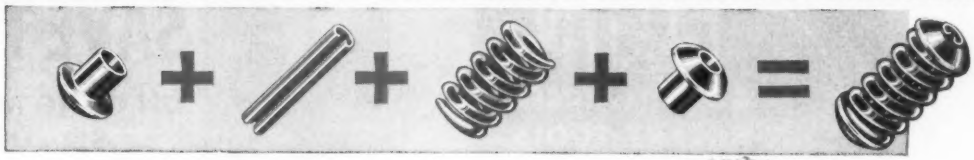
The "Oct-O-Pus," a universal floor-type automatic loader for presses and vertical spindle machine tools, has two arms that rotate through 120° motions, picking up parts one-at-a-time from a conveyor line, depositing them in the press or machine tool, and unloading them onto another conveyor in a total cycle time of two seconds.

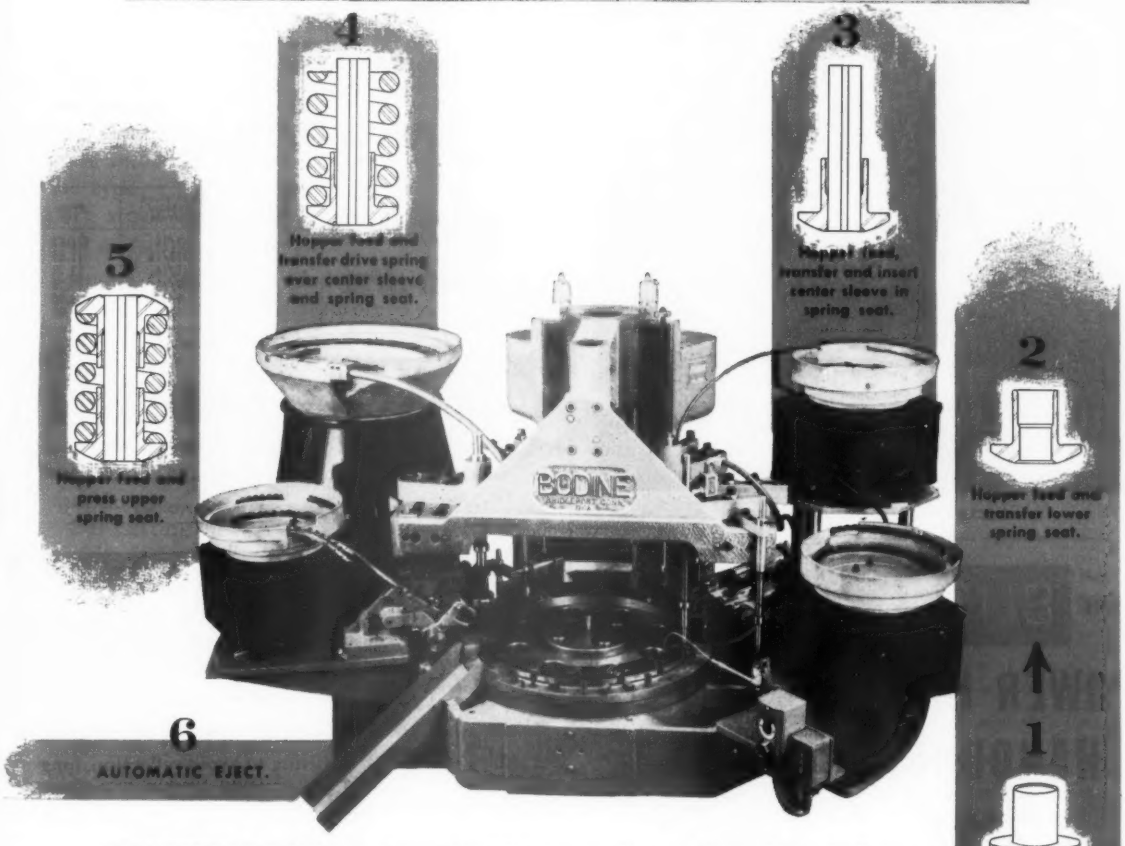
The conveyor-to-press model, with two arms, is especially adapted to the loading and unloading of parts on stamping presses, forging presses, drop hammers, and various types of utility presses and machine tools. Single arm loaders act as press-to-press loaders, automatically handling parts from one press to another in a line.

. . . Continued on page 88

Bodine CASE HISTORY NO. 33

Bodine ASSEMBLES A DAMPENING SPRING *AUTOMATICALLY*





PRODUCTION: This high speed assembly job is automatically performed on a Bodine 42-30 dial type machine, equipped with four Syntron hopper feeds. It is specially tooled for assembly of a dampening spring for an automobile clutch plate.

All four components are hopper fed to position. Production is 40 assemblies per minute . . . automatically ejected.

Bodine engineers can solve your problems for repetitive production of small parts . . . milling, drilling, tapping or assembly, automatically . . . at low cost. Write Dept. TP-1.

You Can't Meet Tomorrow's Competition

With Yesterday's Machine Tools

THE **Bodine** CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

BDS2

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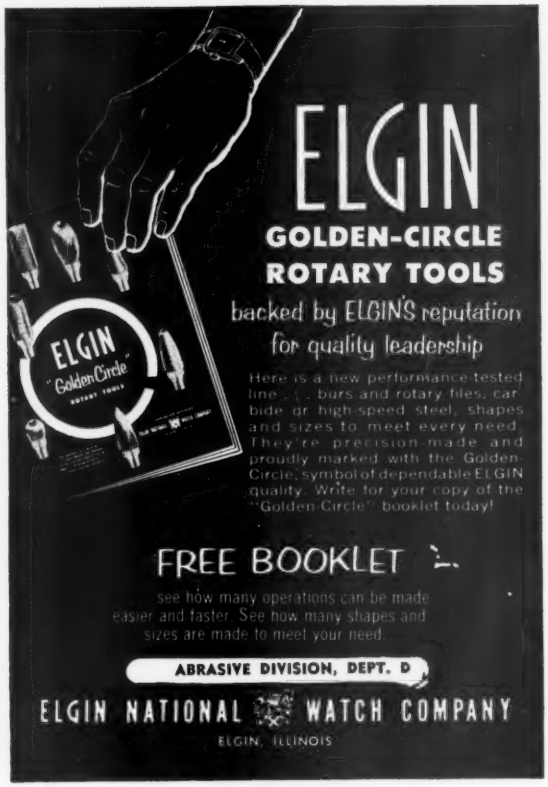
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ROTARY TOOLS
backed by ELGIN'S reputation
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Here is a new performance-tested line . . . burs and rotary files, carbide or high-speed steel, shapes and sizes to meet every need. They're precision-made and proudly marked with the Golden-Circle, symbol of dependable ELGIN quality. Write for your copy of the "Golden-Circle" booklet today!
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see how many operations can be made easier and faster. See how many shapes and sizes are made to meet your need.
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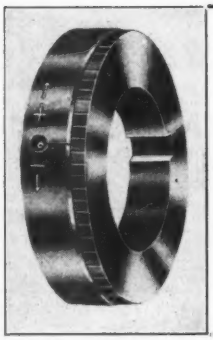

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SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

Size of Cutter Arbor	Maximum Outside Diameter	Price
7/8	1-9/16	$11.50
1	1-13/16	11.50
1 1/4	2-1/16	12.25
1 1/2	2-7/16	12.25
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2	3-1/16	16.50

DAYTON ROGERS
Manufacturing Company
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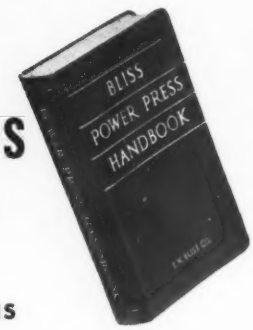
THE BLISS

POWER PRESS HANDBOOK



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Sections cover press job computations • proper die selection • engineering tables • die illustrations • service instructions for Bliss presses • complete glossary • and an index. "One or several are needed in every stamping shop," says *American Machinist*.

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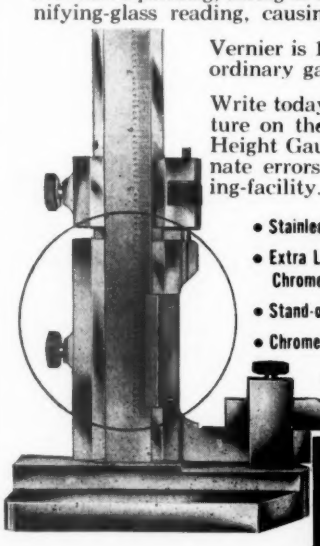
with the **FOSTER** *STAINLESS* HEIGHT GAUGE

No more squinting, tilting to avoid reflection, magnifying-glass reading, causing undue eye-strain.



Vernier is 1.225 or twice that of ordinary gauges.

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- Stainless Scale, Chrome-Plated.
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Sizes: 12" to 48"

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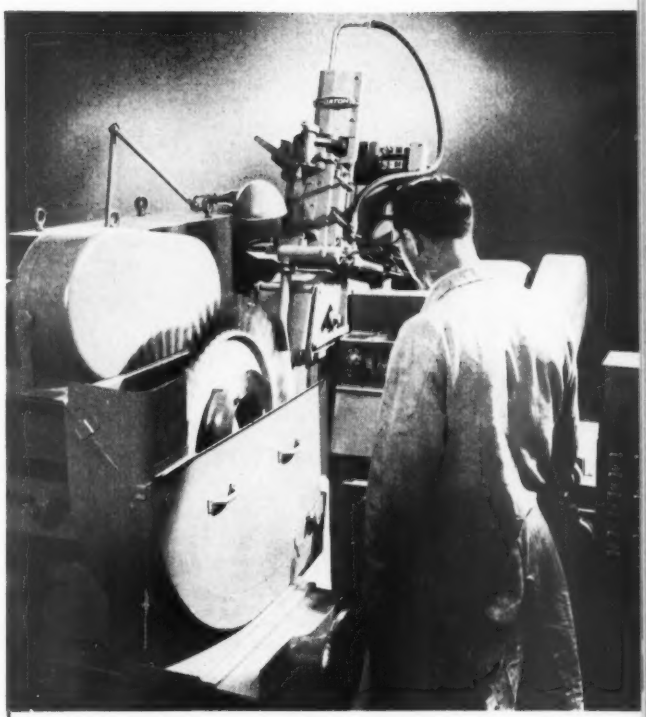
CIRCLE INFORM-A-GRAM KEY NO. 864

. . . Stainless Steel Grinding, from page 82

Fig. 3. (Right) Here a jet engine compressor wheel is O.D. ground on Norton 42" HI-SWING Semi-Automatic Chucking Grinder. Blade material of 403 or 410 type stainless steel or equivalent calls for ALUNDUM abrasive wheel.



coolant has been tried together with the recommended CRYSTOLON abrasive wheel and wheel loading is still a factor, then the same CRYSTOLON wheel specially treated to resist loading usually is effective.

When a stainless steel of this type has to be ground and it gives trouble, it is suggested the problem be referred to our sales engineering department for special consideration. Complete information should be sent us, including the type of stainless steel, a description of the part, stock removal, type of grinding machine and grinding conditions.

Portable Grinding Welded Structures

Norton BD and BFR reinforced resinoid hub type wheels are recommended for grinding stainless steel with portable grinders. For this class of grinding, the same specification in a BD or BFR wheel will be found satisfactory on any of the three groups of stainless steels for the same basic operation. See Table 2 for specific grain and grade recommendations.

For cutting down stainless steel welds where rapid stock removal is most important, the semi-rigid BD type wheel in the specification A24-014BD is recommended. For finish blending of welds and corners where a smooth finish is required, a finer grit wheel, A60-014BD, should be used.

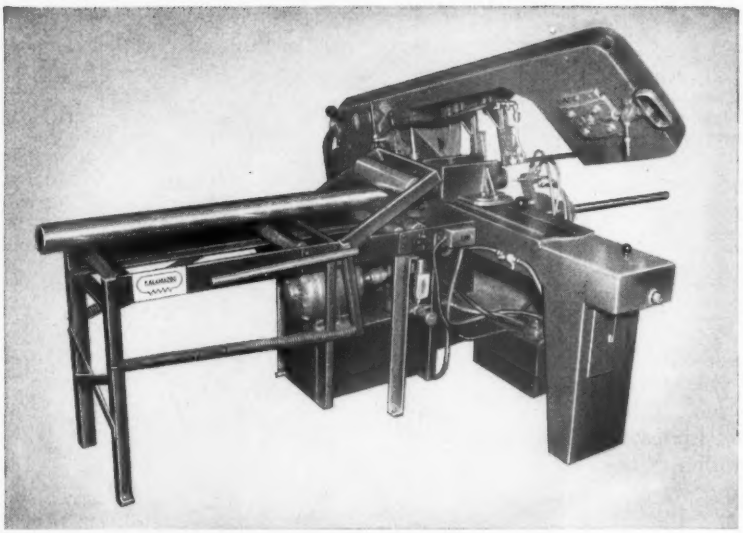
In a relatively flexible type disc wheel which is better adapted to blending contours and general smoothing on stainless steel fabricated parts, the BFR reinforced resinoid wheel is recommended. The two wheels specifically recommended are A24-KBFR for roughing, and a finer grit wheel, A60-KBFR or A80-KBFR, where finish is important.

Both of these BD and BFR type wheels are available in 7" and 9" diameters, and in thicknesses of ⅛" to ⅜". They are widely used on so-called sanders or right-angle portable grinders.

For certain light portable grinding operations on stainless steel, the BF reinforced resinoid wheel may be best. This wheel is particularly suited for breaking sharp edges, and for smoothing and polishing light welds. For this work, an A54-KBF straight type wheel, in a standard diameter and thickness for use on straight type portable grinders, is recommended.

Table 2. Grinding Wheel Recommendations

Operation	*Group A*	*Group B*	*Group C*
Precision Grinding (wet) Stainless Steel Parts:			
Cylindrical, roughing	32A54-M7VG or 37C54-L8V	19A46-L5VG	32A54-M7VG or 37C54-L8V
Cylindrical, finishing	32A80-L7VG or 37C80-L8V	19A60-K5VG	32A80-L7VG or 37C80-L8V
Centerless, roughing	32A46-M7VG or 37C46-M8V	19A46-L5VG	32A46-M7VG or 37C46-M8V
Centerless, finishing	32A60-M7VG or 37C60-M8V	19A60-L5VG	32A60-M7VG or 37C60-M8V
Surfacing, roughing	32A46-J8VG or 37C46-J8V	32A46-I8VG	32A46-J8VG or 37C46-J8V
Surfacing, finishing	32A60-I8VG or 37C60-I8V	32A60-I8VG	32A60-I8VG or 37C60-I8V
Internal, roughing	32A46-K8VG or 37C46-K8V	32A46-K8VG	32A46-K8VG or 37C46-K8V
Internal, finishing	32A60-K8VG or 37C60-J8V	32A60-J8VG	32A60-K8VG or 37C60-J8V
Offhand Portable Grinding Fabricated Stainless Steel Structures (weld grinding; blending contours; smoothing)			
Reinforced Resinoid Hub Type Wheels–			
Semi-rigid, roughing	A24-O14BD	A24-O14BD	A24-O14BD
Semi-rigid, finishing	A60-O14BD	A60-O14BD	A60-O14BD
Flexible, roughing	A24-KBFR	A24-KBFR	A24-KBFR
Flexible, finishing	A60 (or A80) -KBFR	A60 (or A80) -KBFR	A60 (or A80) -KBFR
Reinforced Resinoid Straight Type Wheels–			
Smoothing	A54-KBF	A54-KBF	A54-KBF



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AUTOMATIC BAR FEED ATTACHMENT

speeds sawing, saves man-hours

Kalamazoo

METAL CUTTING BAND SAWS LEAD THE FIELD . . .

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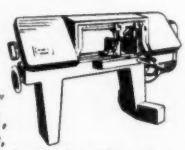
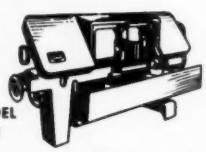
MODEL 8C



Cuts 8" round, 16" flat, 8" pipe. Available with coolant equipment and casters.

MODEL 1220



Cuts 12" round, 20" flat, 12" pipe. Available with coolant equipment and casters.

MODEL 610

Cuts 6" round, 10" flat. Available with coolant equipment and casters.

AUTOMATICALLY FEEDS HEX, ROUNDS, FLATS, PIPE, TUBING—ANY LENGTH FROM 3/16 INCH TO 12 INCHES*

Converts *Kalamazoo* Metal Cutting Band Saws to completely automatic cut-off machines.

A completely hydraulic self-contained unit.

Easy to adjust . . . quickly installed . . . accurate repetitive cutting . . . no delicate electrical equipment.

Kalamatic gives you high-production savings never before possible at such low cost.

ASK YOUR *Kalamazoo* DEALER FOR FULL INFORMATION.

*Additional feeding length to 30 inches available at extra cost.

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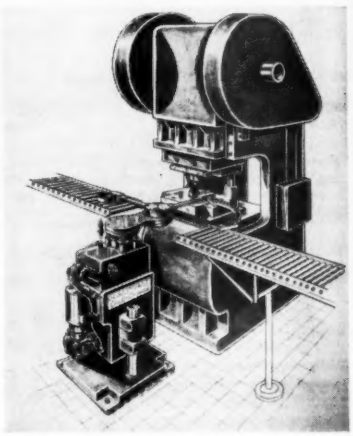
115 HARRISON STREET • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 881

. . . Oct-O-Pus, from page 84

These loaders consist of a motor, clutch, brake, and speed reducer unit; a housing enclosing gear and cam mechanisms; an actuator box on top of the housing, which raises and lowers during the cycle; and a rotating arm assembly attached to the actuator



box, which indexes during the cycle. Two concentric shafts are included in the actuator; the outer shaft indexes the arms and the inner shaft controls clamping units in each arm.

Vertical travel of the actuator box is adjustable from zero to 6" on these "Oct-O-Pus" units by Hautau Engineering Co., 721 Wanda, Ferndale 20, Mich. Arms are made to suit individual operation and part requirements.

Circle Inform-A-Gram No. D2.

New Look In End Mills

The "new look" in Wadell end mills is a result of a new grinding process. "New Design" Wadell mills are ground from the solid on completely automatic machines manufactured by the company. The tools produced are uniform in structure and finish and are ground "wet" to avoid burning the cutting edge.

Performance data accumulated from tests in key production plants indicate that the new tools are far superior to conventional end mills.

The "New Design" end mills are manufactured in all standard sizes and styles up to and including 1" diameter.

Speed Handling
Prevent Mishaps
Cut Cost with

SUPERIOR DIE SETS

LARGE SETS NO LONGER NEED BE BLOCKED . . . SMALL SETS CAN BE LIFTED WITHOUT SLIDING.

Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . . protection for the skilled hands of die makers and handlers . . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment.

E-Z LIFT SLING CHAIN

is especially designed to fit the flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs.

SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. There is no extra charge for this valuable safety feature.

LOCK JAW LIFTING DEVICE

removes the danger of handling large di stes. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.

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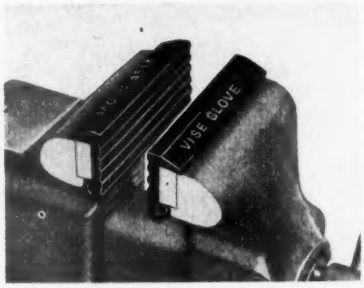

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SNAP on — snap off — easily!

WON'T DAMAGE delicate threading or finishes!

WON'T BURR and damage the next piece of work!

ADAPT to irregular vise jaw shapes!

SIZES . . . from 3 to 6 inches!

4" Vise Gloves **75c** pair*

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*add 10c postage on orders of less than one dozen.

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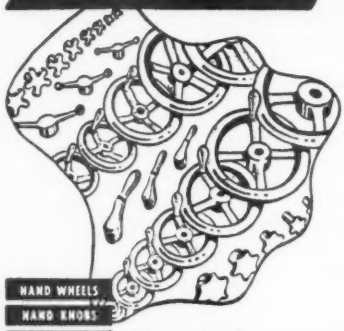
Tomco



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A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

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CARBIDE HEADING DIES REDUCE SCREW PRODUCTION COST

Previous attempts to head hexagon recessed screws in an all-carbide die have been generally unsuccessful. A new die development now allows the tremendous bursting forces, experienced with the heading of hexagon recessed screws, to be absorbed by a tough alloy tool steel cap. The necessary resistance to impact and wear of extruding and pointing is met with a carbide insert.

Photo courtesy Champion Tool and Die Co.

A typical Champion carbide die is illustrated. It is constructed of five pieces, all of which are forced into a carefully matched and precision ground

. . . *Continued on page 94*

BALANCE is why du MONT

High Speed, Ground, Square and Rectangular

TOOL BITS

DO MORE . . . COST LESS

Wear resistance, toughness, red hardness — du Mont Bits put all three together. One quality isn't built up at the expense of another. That's why du Mont Bits *do more* — give you more cuts per bit and per dollar — keep their keen cutting edge — last and LAST!

Make your own tests of comparative performance and you'll standardize on du Mont H. S. Tool Bits.

The du MONT CORPORATION, Greenfield, Mass.

Please mail free Tool Bit COMPARISON CHART, CATALOG and PRICE LIST TP to

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CIRCLE INFORM-A-GRAM KEY NO. 903

Sensational new *VIBRA-FORGE* principle assures unbreakable welds every time!

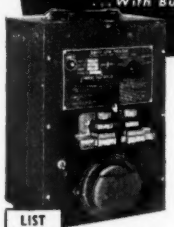
BREN WELD

PORTABLE BAND SAW BLADE

WELDER

...With Built-in Grinder

3/4" capacity



If you've been troubled with band saw blade breakage investigate this Bren/Weld unit built on the new Vibra-Forge principle. It gives you:

- PERFECT WELDS.
- NO BREAKAGE.
- NO FAILURES.
- WEIGHS ONLY 35 LBS.
- OPERATES ON 110 V. AC.
- UNCONDITIONALLY GUARANTEED.

LIST $169.50 PRICE

Write today for complete details

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CAMS

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— Except Screw Machine Cams —

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Design Assistance Offered

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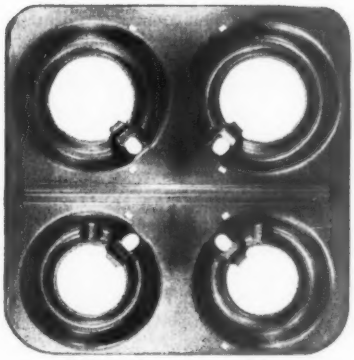

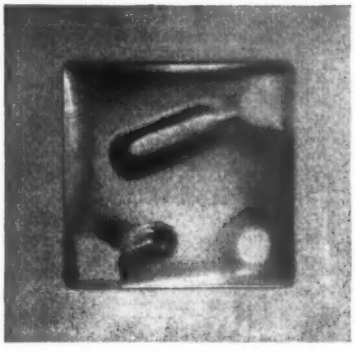

Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.

Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

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. . . Fluid Motion, from page 80

of the template or master in relation to the workpiece and tracer spindle. Duplicating is done at a 1:1 ratio between master and work.

The operator manipulates the table by means of the airplane-type "joystick" lever at his right. This lever is free to move in any direction by virtue of its ball and socket fulcrum; these fully universal movements being transmitted to the table through another ball and socket incorporated in the table driving arm. Consequently, the table faithfully follows all movements of the lever.

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. . . Carbide Dies, from page 90

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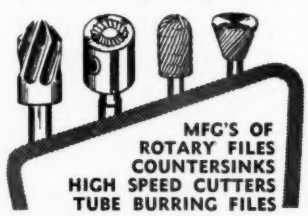

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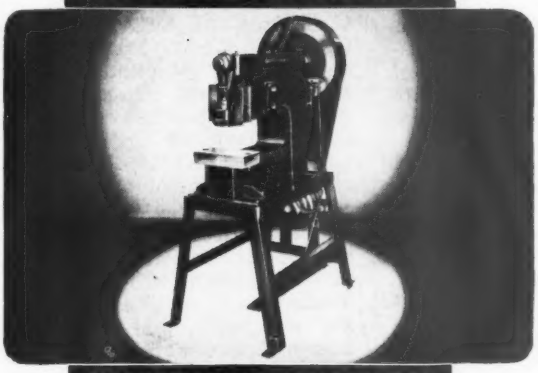

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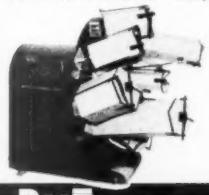

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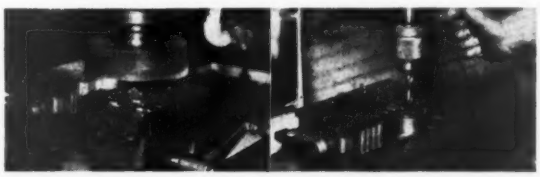

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AUTOMATION-MAGNETIC TAPE CONTROL-MINIATURIZATION-MODULARIZATION Are Highlights of A. I. E. E. Machine Tool Conference

"The trend towards Automation will become increasingly irresistible in the years ahead," according to P. H. Alspach, G-E Manager of Manufacturing Development, speaking before the recent Machine Tool Conference of the American Institute of Electrical Engineers. Alspach went on to say, "the diehards who refuse to accept it [Automation] will, over a long period of time, find that they no longer are competitive with the rest of industry."

The A.I.E.E. Machine Tool Conference, which met in Detroit under the chairmanship of Kurt O. Tech, Chief Engineer of The Cross Company, brought together machine tool builders and users, machine designers, and control engineers. Numerous speakers told of the latest developments and trends in machine tool control and maintenance.

In his address, Alspach of General Electric traced the evolution of automation to its present status as a "way of manufacturing" and as meaning "continuous automatic production." He said, "There are two main factors today that determine the extent to which Automation may be applied **economically** — volume and nature of the product." The speaker went on to say that even in job shop functions there are often some high-volume operations that lend themselves to automatic manufacturing methods. While industry looks at automation at the product level, it generally takes place several steps below that level. "In other words, Automation is generally applied to components and subassemblies of a complete product."

The development of a record playback control system for a skin milling machine was reported by Harry Ankeney of Giddings & Lewis Machine Tool Company and John L. Dutcher of General Electric. By means of this system, a 50% reduction in production time can be achieved for skins produced on the machine which is a type of planer-miller widely used in the aircraft industry.

High-speed automatic inspection and sorting machines, employing various unique electronic circuitry techniques, were discussed by Mac Arlin of Arlin Products, Inc. Any special machine of this type is built around four basic, packaged-circuit, plug-in units. Ultra-high frequencies and reed-type sensors are used, overcoming many difficulties encountered with conventional 60-cycle equipment.

Development of miniature packaged units, each containing a single standardized functional circuit, was announced by J. W. Picking and A. V. Wise of Reliance Electric & Engineering Co.

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These units, first of their kind designed specifically for industrial electronic motor control, are mechanically protected and sealed in a high dielectric plastic material. The new Sealpak units are believed to eliminate all current objections to the application of electronics to industrial control problems.

But probably the most important message was delivered by Ralph E. Cross, Executive Vice President of The Cross Company, who claimed, "Tomorrow's machine tools should be modern versions of Aladdin's Lamp. In production terms this means more productivity combined with more flexibility."

"Most people," Cross asserted, "believe the answer to increased productivity is more and better automation, but there is a different feeling about flexibility; some companies are interested in it, others are not. It is my opinion that machine tool builders must provide more flexibility before automation will be universally accepted.

"The philosophy of modular construction offers one of the best ways of getting flexibility into automation at reasonable cost. Machine tool modularization may be defined as building machines from standard components or building blocks. Building blocks, like pieces of an erector set, are assembled in different ways to make machines for different purposes." Cross went on to demonstrate visually what his company is doing to provide some of the needed building blocks.

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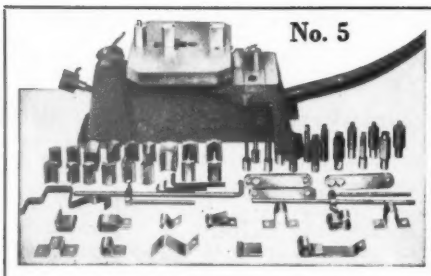

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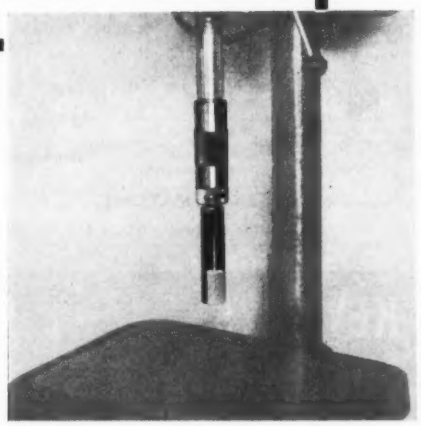

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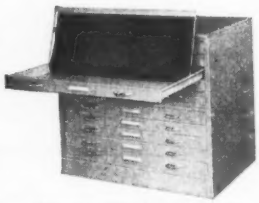

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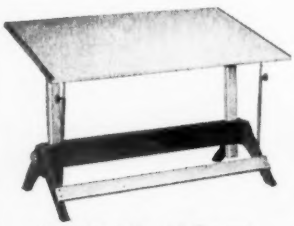

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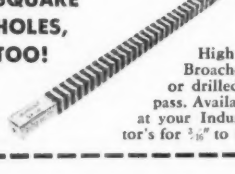

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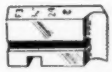

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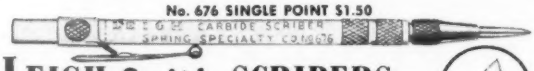

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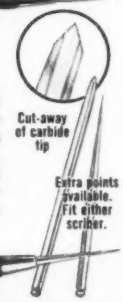

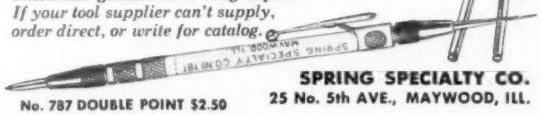

No. 787 DOUBLE POINT $2.50

SPRING SPECIALTY CO.
25 No. 5th AVE., MAYWOOD, ILL.

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DYKEM STEEL BLUE
Stops Losses
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Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
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2303L North 11th St. • St. Louis 6, Mo.
With DYKEM Steel Blue
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DEKA BORE

saves

80% of boring time

DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000″ on the full diameter as easily as reading 1/16″ on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

100% GUARANTEED!

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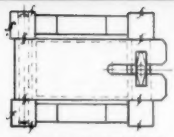
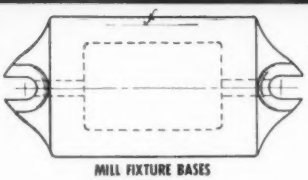
WITH NOBLE & STANTON
Standards
Save 2/3 the Cost of Custom Making!

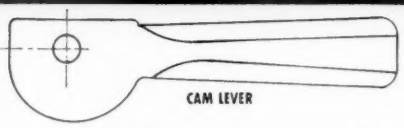
Complete Line of Top Quality
JIG and FIXTURE COMPONENTS
Stocked for Quick Delivery from Dealers Coast-to-Coast

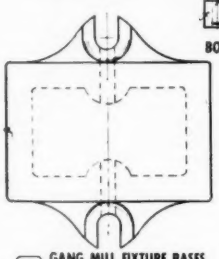
CUT Man-Hours—CUT Design Time—CUT Toolroom Costs

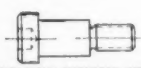
SPHERICAL WASHERS

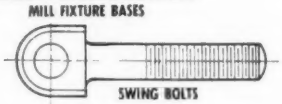

BOX JIGS—RECTANGULAR

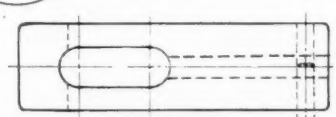

MILL FIXTURE BASES

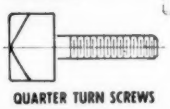

CAM LEVER

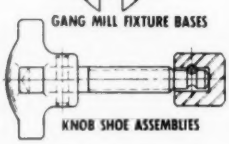

GANG MILL FIXTURE BASES


SOCKET HEAD SHOULDER SCREWS

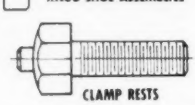

SWING BOLTS

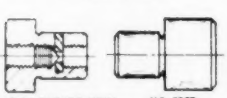

HEEL CLAMPS

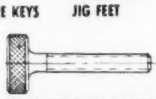

QUARTER TURN SCREWS

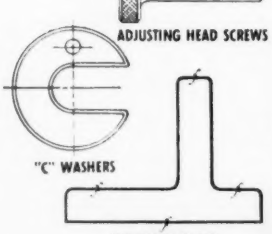

KNOB SHOE ASSEMBLIES

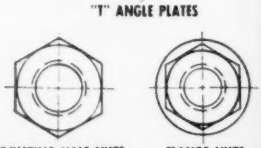
GROUND THREAD STUDS


CLAMP RESTS


SURE LOCK FIXTURE KEYS JIG FEET


ADJUSTING HEAD SCREWS


"C" WASHERS "T" ANGLE PLATES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- Jig Leg Plates
- Torque Screws
- Toggle Pads
- Locating Pins
- Ball Hand Knobs
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3	20	36	771	903	972	1051	1153	1252	1302	1341	1483	1542	1602	1652
4	21	37	781	904	973	1061	1161	1253	1303	1351	1484	1543	1603	1653
5	22	38	801	905	981	1071	1171	1254	1304	1361	1491	1544	1604	1654
6	24	39	811	911	982	1081	1181	1261	1305	1371	1501	1551	1611	1655
8	25	40	831	931	983	1091	1182	1262	1306	1381	1502	1552	1621	1656
9	26	41	841	941	984	1101	1183	1263	1311	1391	1511	1561	1622	1671
10	27	42	851	942	991	1111	1191	1264	1312	1401	1512	1562	1623	1681
11	28	43	861	943	992	1121	1201	1271	1313	1402	1521	1563	1631	
12	29	44	862	944	993	1131	1211	1281	1314	1411	1522	1564	1632	
13	30	46	863	951	1001	1141	1221	1282	1321	1421	1523	1571	1633	
14	31	47	864	952	1011	1142	1222	1291	1322	1431	1524	1581	1641	
16	32	48	881	953	1021	1143	1223	1292	1323	1441	1531	1582	1642	
17	33	50	891	954	1022	1144	1231	1293	1324	1451	1532	1591	1643	

EDITORIAL ITEMS

A1	A16	A31	A46	B2	B17	B32	B47	C2	E4
A2	A17	A32	A47	B3	B18	B33	B48	C3	E5
A3	A18	A33	A48	B4	B19	B34	B49	C4	E6
A4	A19	A34	A49	B5	B20	B35	B50	C5	E7
A5	A20	A35	A50	B6	B21	B36	B51	C6	E8
A6	A21	A36	A51	B7	B22	B37	B52	C7	E9
A7	A22	A37	A52	B8	B23	B38	B53	C8	E10
A8	A23	A38	A53	B9	B24	B39	B54	C9	E11
A9	A24	A39	A54	B10	B25	B40	B55	D1	E12
A10	A25	A40	A55	B11	B26	B41	B56	D2	
A11	A26	A41	A56	B12	B27	B42	B57	D3	
A12	A27	A42	A57	B13	B28	B43	B58	D4	
A13	A28	A43	A58	B14	B29	B44	B59	E1	
A14	A29	A44	A59	B15	B30	B45	B60	E2	
A15	A30	A45	B1	B16	B31	B46	C1	E3	

Which article in this issue was of most interest to you? _____

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A3	A18	A33	A48	B4	B19	B34	B49	C4	E6
A4	A19	A34	A49	B5	B20	B35	B50	C5	E7
A5	A20	A35	A50	B6	B21	B36	B51	C6	E8
A6	A21	A36	A51	B7	B22	B37	B52	C7	E9
A7	A22	A37	A52	B8	B23	B38	B53	C8	E10
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A9	A24	A39	A54	B10	B25	B40	B55	D1	E12
A10	A25	A40	A55	B11	B26	B41	B56	D2	
A11	A26	A41	A56	B12	B27	B42	B57	D3	
A12	A27	A42	A57	B13	B28	B43	B58	D4	
A13	A28	A43	A58	B14	B29	B44	B59	E1	
A14	A29	A44	A59	B15	B30	B45	B60	E2	
A15	A30	A45	B1	B16	B31	B46	C1	E3	

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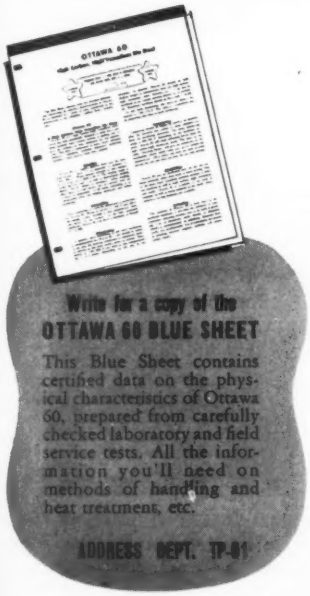
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● You can solve many a problem and save real money with Ottawa 60 draw dies! Write for information or call in our Field Service Staff to help you get started. ***Allegheny Ludlum Steel Corporation, Oliver Bulding, Pittsburgh 22, Pa.***

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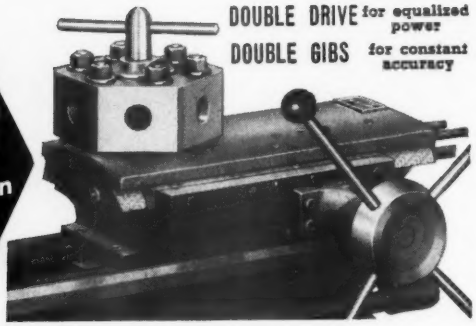

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•

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•

Feb. 8-10. The Society of the Plastics Industry, Inc. 10th Annual Reinforced Plastics Division Conference. Hotel Statler, Los Angeles.

•

Mar. 14-18. American Society of Tool Engineers. 1st Western Industrial Exposition. Shrine Auditorium and Exposition Hall, Los Angeles.

•

Mar. 16-18. Pressed Metal Institute. 6th Annual Spring Technical Meeting. Hotel Carter, Cleveland.

•

Mar. 28-29. American Institute of Electrical Engineers. Materials Handling Conference. Hotel Cleveland, Cleveland.

•

Mar. 28-Apr. 1. American Society for Metals. 9th Western Metal Exposition. Pan-Pacific Auditorium, Los Angeles.

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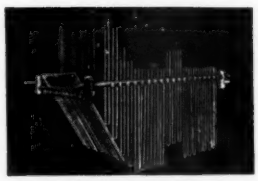

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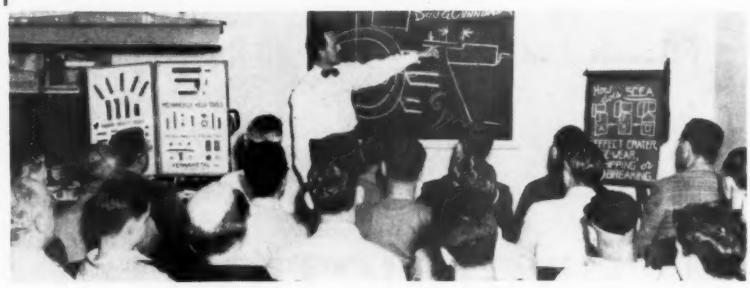


A FOREMAN once remarked, "You carbide tooling field men always get the easy jobs and we get stuck with applying carbide on the tough jobs. Here's one I'd like to see you run." His job was one of turning and facing a cast steel gear having eight interruptions. By using the right grade of carbide with the correct style tools at the proper speeds and feeds, the gear was successfully machined. This foreman had anticipated failure on the first piece — but, instead, watched four gears machined without difficulty before the tool required any reconditioning.

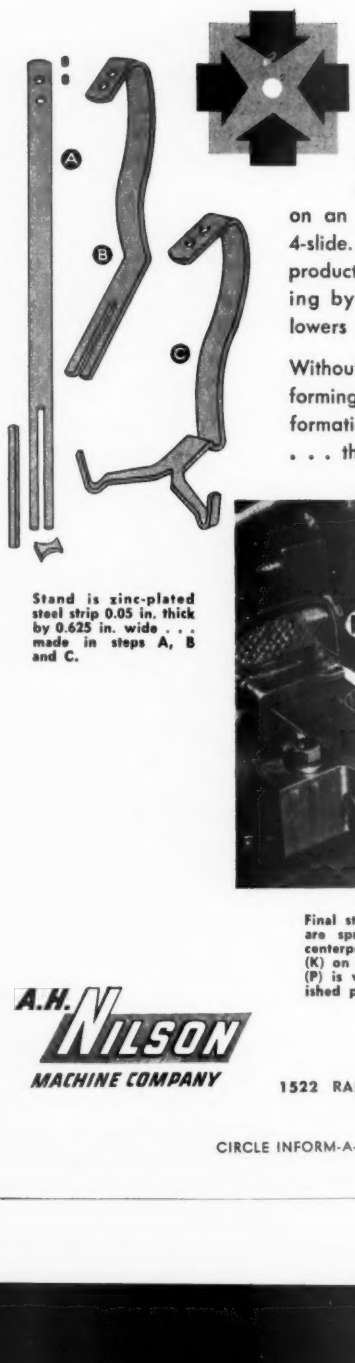
The above experience is becoming a daily occurrence and is the result of the method by which most machine shops first became acquainted with the full potential of tungsten carbide tools. The operator was machining with high-speed steel one day and the next day he was using carbide tooling to meet his accelerated delivery schedule in order to give our fighting men the weapons needed to win a war. He learned to live with this new cutting material but failed to get the maximum output from his new tools.

by R. W. Phelps
Application Engineer
KENNAMETAL INC.
Milwaukee, Wisconsin

Today many operators are still thinking in terms of high-speed steel. Some have no idea how tungsten carbide is made; many use the wrong style tool or fail to realize the many advantages of the various carbide grades. In addition, many operators do not know how to grind carbide correctly. Every day these operators are costing their company money and in turn making their employer less competitive.

Course is Specialized — But Flexible

Realizing the vast problem of training operators in the correct methods of using carbide tooling, my company developed a specialized — but flexible — training program to meet the specific requirements of each plant. These



Stand is zinc-plated steel strip 0.05 in. thick by 0.625 in. wide . . . made in steps A, B and C.

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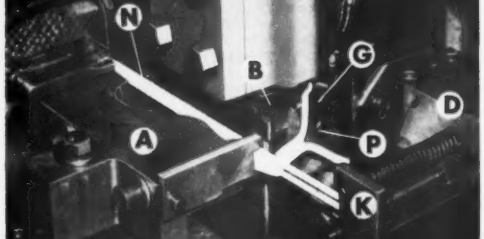

Final step in forming Kaz stands on Nilson 4-slide. Feet are spread, bent, crimped (G) with workpiece (P) on centerpost while next piece (N) is being cut off. Stop (K) on right slide (D) backs off after cut and workpiece (P) is wrapped around centerpost by die (A) when finished part is clear.

A.H. NILSON MACHINE COMPANY

1522 RAILROAD AVE., BRIDGEPORT 5, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1041

GREATER PRODUCTION AT LESS COST

training programs are conducted in the employer's own plant to groups of about 15 to 20 of his men. In this manner the training takes on the air of just a friendly discussion and, as a result, the class participation is usually quite good. Content of the program is designed to answer four basic questions which have been found to be the downfall of many operators using carbide:

1. How do I choose the correct grade of carbide?
2. What is the correct style tool for the job?
3. Am I getting the best results possible?
4. What grinding methods should I use?

After completing the classroom training, Kennametal service engineers spend up to a week in the customer's plant working on all shifts to answer questions and help the men apply the principles which were discussed, and attempt to solve machining problems which have proven difficult in that particular plant.

Does the training program pay off? It certainly does. Here are just three of many examples which are the direct result of these programs. The machine operators experimenting by themselves in all the following cases applied the basic principles of machining with carbide, and were greatly surprised with their results.

Example One — During our discussion on how to properly grind carbide tools, the men were informed that honing the cutting edge will greatly increase tool life. The action of the hone removes the ragged edge left by grinding which will cause minute chipping. The best method is to hone across the cutting edge and nose radius at a 45° angle until there appears a land approximately 0.005″ wide.

The operator in this case had always been under the impression that honing would only dull his tool. However, the tool life on his job was not earning him a bonus, so he decided to try honing. The job was to bore a 5.90″ dia. hole approximately 12″ long with a depth of cut of 0.025″. He was running the job at 490 sfpm with a feed of 0.009″. Previously his tool life was only 2 pieces per

. . . *Continued on page 108*

DOUBLES OUTPUT

New Rotor D-6 Air Grinder pays for itself in 5 weeks

JOB: Removing flash and parting lines from steel castings. Tool used 50% of production time.

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INDUSTRIAL METALLURGY*

by Dr. Robert J. Anderson
Head, Department of Metallurgy
SOUTHWEST RESEARCH INSTITUTE
San Antonio, Texas

PRACTICAL METALLURGY is older than Tubal Cain, the biblical character who is often referred to as the first artificer in iron. Modern industrial metallurgy is a development of the last fifty years, and during this relatively short period it has become a highly specialized and complex science.

The principal branches of present-day metallurgy include extra-active metallurgy, mechanical metallurgy, foundry practice, the metallurgy of secondary and scrap metals, electrometallurgy, and physical metallurgy. In addition, certain specialties may be mentioned—for example, powder metallurgy, the metallurgy of cermets, theoretical metallurgy, alloy metallurgy, heat treatment, and metallurgical furnace work.

Experts practice in all the metallurgical fields. Besides, metallurgists specialize in the metallurgy of steel, of aluminum, of zinc, of nickel, and of various other metals and alloys.

Mechanical Metallurgy

Extractive, sometimes called reduction, metallurgy is concerned with the practice and methods of obtaining metals from their ores. Again, the metallurgy involved in extraction, whether of copper or lead or titanium, is highly specialized. Mechanical metallurgy relates to the working and shaping of metals and alloys into various commercial forms, including such diverse articles as railroad rails, electrical transmission wire, cooking utensils, automobile bodies, furniture, pipe for water and gas, and foil for packaging.

Foundry practice comprehends the production of castings by pouring alloys in sand or metal molds. Castings are also made by injecting alloys under pressure into die cavities. The metallurgy involved in the recovery of metals from scrap and wastes ranges from simple remelting through true smelting and electrodeposition. The term physical metallurgy is frequently used to include studies of the constitution of alloys, heat treatment, and radiography together with mechanical and physical testing.

The modern industrial metallurgist is required to have a good basic knowledge of economics. This fact has given rise to still another branch or division in the metal field known as metal economics. In the application of metals as engineering materials, it is usually necessary to specify precisely the properties and compositions required. Some metallurgists restrict themselves to the preparation of specifications.

Increased demand for industrial scientific research in the field of metallurgy has recently brought about the establishment of a department of metallurgy at Southwest Research Institute. This demand has been intensified

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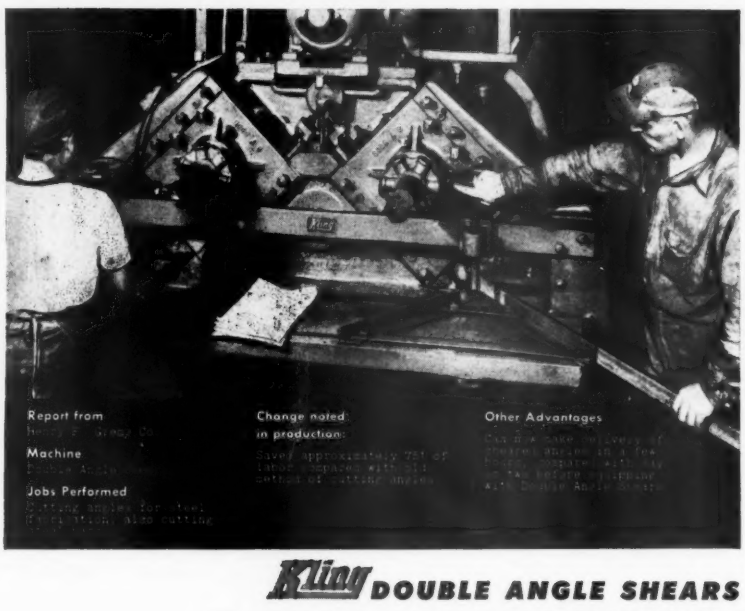

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by the rapid industrialization of the Southwest in recent years and by the needs of various Federal agencies concerned with defense. At the outset, the new department is undertaking industrial research in extractive metallurgy, physical metallurgy, and foundry practice as well as studies in metal economics.

Reducing Costs

One important aspect of industrial metallurgy involves the reduction of costs in metallurgical works and metal-fabricating plants. This may require the development of new methods or may mean simply a small change in operating technique. In the case of foundry practice, costs in high volume shops may sometimes be substantially lowered by reducing the percentage of scrap or waster castings produced. Costs may likewise be reduced in the foundry by instituting methods for salvaging castings which are scrapped because of defects. For example, this may be done by welding or by impregnating to effect pressure tightness.

Another aspect of industrial metallurgy relates to the improvement of metal quality which also may have a bearing on costs. The quality of metal products has been greatly enhanced during the last twenty-five years by innovations in melting furnaces, the use of protective atmospheres in melting, the application of fluxes and deoxidizers, and the introduction of degasification — bubbling gases through molten metals to remove dissolved gases which would cause porosity.

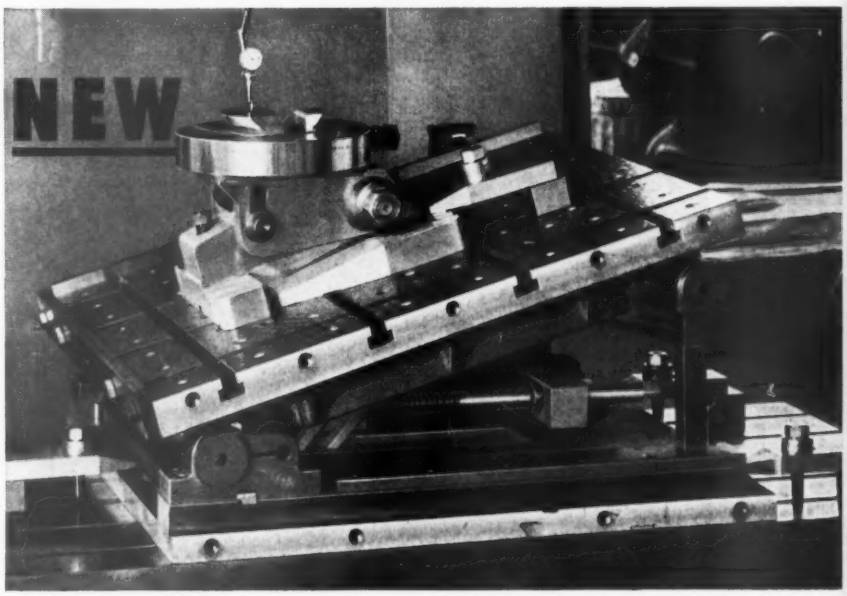
In materials engineering, as for example in the selection and utilization of metals for building motor cars and aircraft, the metallurgist plays an important role. Mechanical properties, machinability, general processing performance, and costs of numerous steels, light alloys, and other materials have to be studied continually in order to provide a thoroughly satisfactory material for the least money. The investigation of substitutes and alternates is especially important during periods when supplies are scant as in war. In any case, specifications need to be constantly reviewed and advantage taken of new developments in the field of metals.

Testing for Flaws

In the divisions of testing and inspection, the work and interest of the modern metallurgist extends from the examination of samples under the microscope to X-ray studies and destruction tests of parts, assemblies, and structures. Much special technical apparatus is required in control operations. This includes equipment for measuring temperatures, for detecting internal flaws and external cracks, and for rapid chemical analysis in large volume production. The usual equipment employed in mechanical testing is indispensable. In this category, tensile, fatigue, creep, and hardness testing machines may be mentioned.

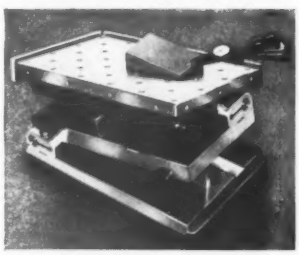
Corrosion is another large field where the interest of the metallurgist finds wide scope. Investigations over a period of years have served to elucidate the causes of corrosion and have enabled the metallurgist to produce alloy compositions to resist cor-

. . . *Continued on page 110*



Robbins SINE PLATE

WITH 24" x 24" WORKING AREA



Smaller Sine Plates are also available in models for both single and compound angles. Thousands are in daily use. Full details are in our illustrated catalog. Send for your free copy.

Designed on the sine bar principle, this husky new addition to the Robbins Sine Plate family provides gauge-block accuracy to angular set ups for very large, bulky work pieces. Any angle is quickly and accurately set up by inserting the correct standard gauge blocks between the top plate and the base of the unit.

In addition to the sturdy construction of these units, and to eliminate any possibility of dimensional inaccuracies due to distortion, gauge blocks are inserted at each side of the Sine Plate. Top plate is raised and lowered by a simple screw-type mechanism . . . positioning is simple, safe, sure.

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Complete information on these new extra-large Sine Plates or models built to specifications will gladly be forwarded upon your request.

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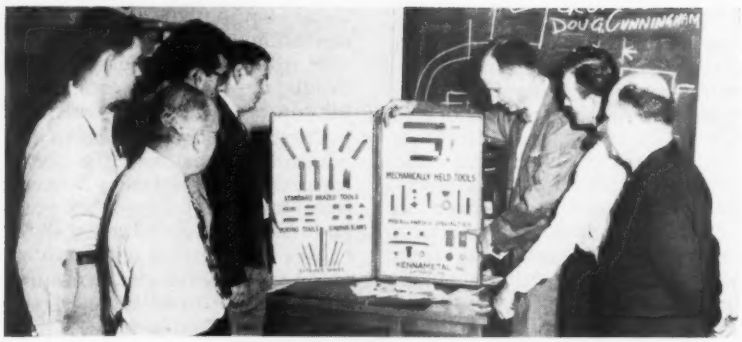
Also producers of special gauges and fixtures

. . . Training, from page 105



grind; now with honing, tool life increased to 10 pieces per grind. On this particular job the tool cost dropped from 8.2 to 1.6 cents per piece.

Example Two — Our training program constantly emphasizes that if coolant is to be used there must be at all times a continuous flow directly onto the tool point giving complete immersion. When taking a heavy depth of cut, the resultant extra wide chip forms an obstruction and permits the coolant to reach the cutting edge only intermittently. As a result, the tool is subjected to rapid temperature changes which will cause the carbide to become crazed or to develop thermal cracks.

One operator recognized his problem as being one of improperly applied coolant. He spent 15 minutes adjusting his setup in order to get the coolant under the chip by directing the flow from beneath the tool. After changing his setup, all tool trouble disappeared. Tool life jumped from 3 to 21 pieces per grind; tool cost dropped from 8.3 to 1.2 cents per piece.

Example Three — In our "In-plant Training" an attempt is made to familiarize the "students" with some of the physical and mechanical properties of carbides which affect them directly in their everyday operations. We stress that carbide when heated will expand only 50% as much as the heated steel shank. As a result, brazed carbide tools can be broken by this difference in the expansion rates of the two materials.

On a particular roughing cut, an operator preferred to run his job without any coolant, but the ⅝" depth of cut and limited selection of speeds on the machine — which had him running below the proper speed — transferred an excessive amount of heat into the tool. Because of the difference in expansion factors between the steel shank and the carbide tip of the brazed tool, the carbide tip on his tools would break. The operator realized the difference in expansion factors was the cause of his breakage and also remembered our saying this condition could be eliminated by using mechanically-held carbide tooling. Using his newly acquired knowledge, this operator put in a mechanically-held tool and his

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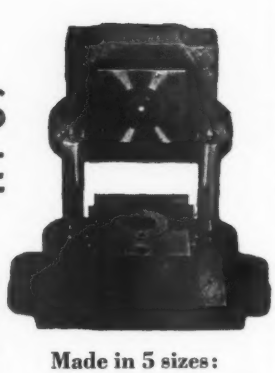

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Made in 5 sizes:
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breakage completely disappeared. Where the brazed tool would break before machining a complete piece, the mechanically-held carbide successfully machined from 3 to 4 pieces before requiring any reconditioning.

Time Required For Training — Well Spent

I find that after having given a complete training session, my job as a service and application engineer is quite a bit easier. Honing of tools is now an accepted practice. I see operators checking their Kennametal tool manuals to select the proper style tool, and after running a piece or two on the machine, checking the wear land to determine if they are running at the proper speeds and feeds.

How does today's management feel about training their personnel? Well, one plant superintendent told us we were 20 years too late but did allow us to give the in-plant training program to a selected group, of which he was one. After having heard the entire program, he requested we give the program to all of their machine operators. Management at another company had us come back six times in order to give the program to every operator in their plants.

Top management of still another company had us give our training program to every operator employed at their plant. The first class was held at 1.00 P.M., the second class at 7:00 P.M., and the third class at 11:00 P.M. They can now show a definite reduction in tool breakage and an increase in plant efficiency upon completion of the course. In addition, management has had a reduction in the number of complaints about the feeds and speeds set by the methods and time study departments. Men on the machines now realize the predetermined speeds and feeds are the speeds and feeds required in order to run carbide properly.

The art of removing metal has been rapidly advancing in the last 10 to 15 years. This advancement has mainly been the result of the development of newer and better carbide cutting tools. Today we find the machine tool builders redesigning their products in order that their customers may receive even greater benefits from modern carbide tooling. But when industry permits men running the machines to think in terms of high-speed steel while they are using carbide tooling, any investments in new machines and new carbide tooling will fall far short of management's expectations. When industry invests in new machines, industry should also invest in their men running the new machines by taking the time to see that they are properly trained to use carbide tooling.

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. . . Metallurgy, from page 107

rosive attack under a great variety of conditions. Stainless steels, aluminum alloys that resist corrosion by sea water, special compositions for resisting hydrochloric acid, copper-bearing steels, certain nickel alloys, and clad metals are some of the developments in this field. In this connection, it may be added that various alloys have been made available which have exceptional resistance to oxidation at high temperatures.

The diagnosis of service failures in metals is another specialty of the metallurgist. Failures may arise in the operation of machinery, or in the use of parts or structures, for a number of reasons. These include incorrect design, the specification of unsuitable materials, overloading, and metallurgical defects. The objects of investigating service failures are to ascertain the causes and to prevent their recurrence. In order to determine whether the metallurgy is at fault, chemical analysis, microscopic examination, mechanical tests, and X-ray examination may be required. From the assemblage of data obtained in the investigation, it is ordinarily possible to reach a satisfactory conclusion.

Money-Saving Improvements

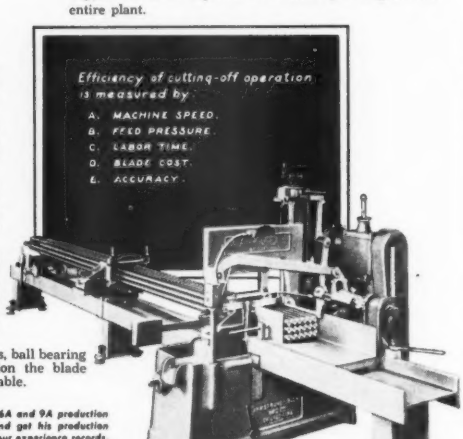
This short review of industrial metallurgy covers only broadly what it is and what it can do. A few examples have indicated the work of the metallurgist. Modern metallurgy makes possible money-saving improvements in coal mining, petroleum refining, food preparation, gas and power utilities, heavy chemicals, electrical manufacturing, and building. Modern metallurgy is requisite in raising the performance of machine tools so essential for high production operations. It assists in reducing costs and improving quality. It helps to build better motor cars, faster airplanes, more comfortable houses, and more satisfactory home utilities. It is basic for defense.

Efficiency in Cutting-off is Important

Practically all machining operations start with pieces cut-off from bars or billets. Hence, inefficiency, or lack of capacity, in the cut-off department can hold up or stagnate the entire plant.

A. Are all-ball-bearing and provide a quick return; therefore they run FASTER than others on the same work.
B. Can apply as much as 1200 pounds feed pressure—two to ten times as much as other hack saws and band saws.
C. Are fully automatic, requiring no more operator attention than an automatic screw machine; and set-up for any bar size and cut-off length is extremely simple.
D. Use a non-breakable high speed hack-saw blade — the type of saw blade that produces the greatest number of square inches of metal cut per dollar of blade cost—two to ten times (or more) as much as any band saw.
E. Because of their exceptional sturdiness, ball bearing reciprocating frame, ability to tension the blade "truly taut", their accuracy is dependable.

If you are not using modern, improved MARVEL NO. 6A and 9A production hack saws, call the local MARVEL Field Engineer and get his production and cost estimates on your work—to compare with your experience records.



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Formula for Accuracy in Metal Sawing:
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Straightness, Squareness = (Blade Rigidity, Blade Tautness)
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Write for catalog C-55—showing and describing eleven different series of Metal-Cutting Sawing Machines and MARVEL High-Speed-Edge Hack Saw Blades and Hole Saws.

The composite MARVEL High-Speed-Edge Hack Saw Blade—cuts **any** machinable material efficiently. There is no time lost changing blades for different types of steel; no time lost replacing shattered blades, because MARVEL High-Speed-Edge Hack Saw Blades are positively **unbreakable.** These superior blades have the finest high speed steel cutting edge welded to a strong alloy steel body. They will stand-up under the highest speeds and heaviest feeds attainable on any make hack saw. Can be safely tensioned tauter than any other blade—cut-off not only straight but also square and with less stock loss.

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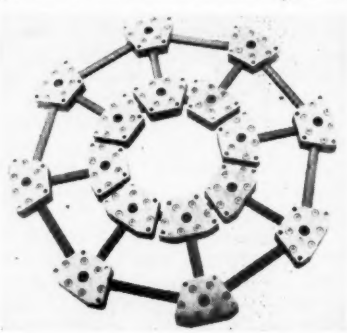


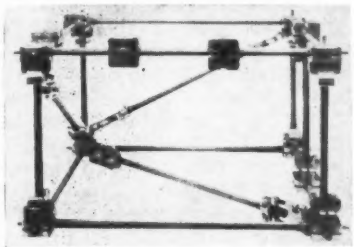
Photos courtesy Wharton and Wilcocks of America Incorporated.

A Unitube basic set consists of 323 elements plus 500′ of high tensile octagonal tubing drawn to prescribed tolerances. The bores in the elements are also octagonal. This shape gives definite location to the attached parts and eliminates slippage.

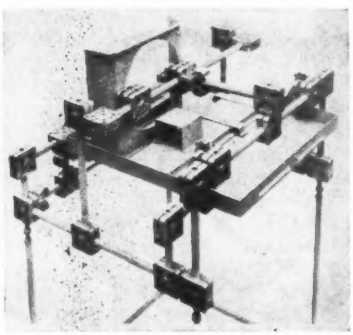
The joint elements take the form of "sandwiches" split on the

axis of the tubing, being held together by socket head screws.

The accompanying photographs show jigs constructed by an electrical manufacturer for



welding a window type air conditioner with portable spot tong welders. The elapsed time to produce this fixture was approximately three hours, no design work and no highly skilled manhours were required. Any modi-



fication required can be incorporated in minutes.

In the basic set there are elements to provide diagonal struts; duplex adjustment; tee slotted elements; hinged tube attachments for freely moving portions of a structure; and joint assemblies for circular and cylindrical structures.

An advantage of this system is that any structure can be disassembled and the elements reused over and over again.

SOLAR INSTALLS BLANCHARD UNITS FOR GRINDING

Steel of any gauge or thickness can be precisely ground in the complete, new Blanchard grinding department of the Solar Steel Corp., Los Angeles.

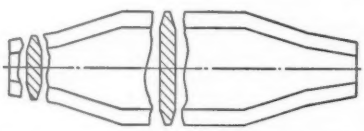
This service is one of the improvements made since Solar acquired Rawlins Bros. Co. last January. In addition to regular warehouse services and stocks, West Coast metalworkers now have a department whose range of processing equipment can be found nowhere else in the area.

The most recent addition to the grinding department, the high powered, rotary type Blanchard grinder is the largest of its type on the West Coast. It maintains unlimited accuracy and ranges on the diameter or diagonal to 86", or, with special attachments to 96".

Solar also has a new rotary type No. 18C Blanchard fully automatic grinder for long run, high production jobs. It accurately sizes to precision tolerances automatically and will repeat itself in sizing from one load to the next, holding the same dimensions within 0.001".

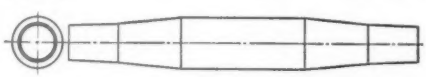
Other services available to West Coast fabricators and manufacturers from this single source are flame burning, plate levelling, normallizing, and annealing.

Swaging prior to forging . . .
saves materials, machining, trimming



This precision-forged piece under normal procedures would have required extensive trimming and machining operations.

But Torrington's swaging experts suggested a method that saved time and material—cut finishing operations to a minimum.



A round blank was swaged to a predetermined double taper shape prior to forging. This produced a forging blank of the required uniformity that facilitated the flow of metal to the desired shape in the forging operation.

And, since the new blank was smaller than the one used before swaging, expensive material was saved.

Swaging Advantages . . . No Chips . . . No Waste . . . No Scrap

Swaging reduces metal—saves material—does not cut it away wastefully.

Swaging work hardens metal—gives it added strength, better finish and resiliency, dimensional accuracy.

Swaging is fast—can be done by unskilled workers to produce more pieces at lower cost.

Write for our informative booklet on swaging that gives detailed descriptions of Torrington Rotary Swagers. It may show you how to achieve new savings in your own plant.

THE TORRINGTON COMPANY
Swager Department
6 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1111

DESIGNING DEPENDABILITY AND SAFETY INTO TRANSFER MACHINES*

by Judson H. Mansfield
Engineering Consultant
GREENLEE BROTHERS & COMPANY
Rockford, Illinois

FIXTURES are of two distinct types. In both types the work, plate, or fixture carrying the work is positioned by two dowel pins and clamped against hardened rails or pads at each working station.

Both dowel-pin operation and clamping are by means of hydraulic cylinders or hydraulic motors geared to clamp screws. Judgment must be used in determining the force of the clamping action — first, to hold the work rigid during the tool cuts and, second, not to distort it.

Fixture frames retain their shape and absorb vibration set up by the cutting action of the tools best if made of normalized cast iron. Steel weldments can be used where accuracy is not too important, but they are not as stable as cast iron.

For fragile work it is advisable to make up a sample fixture, mount it in a standard machine, and perform the actual machining operation at the approximate tool speed and feed. Thus, the fixture design can be approved and corrections made where needed before all the fixtures are in work.

We have furnished fixtures with air-operated gages to check work faces for trueness of plane. These prevent starting the machining operation on inaccurate pieces.

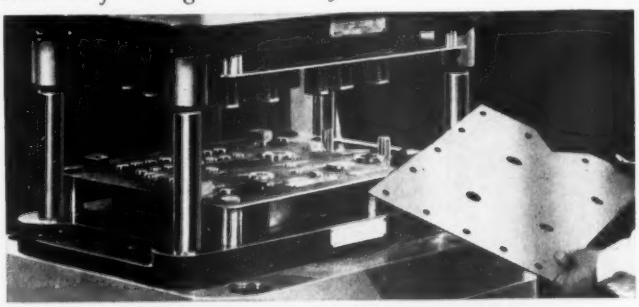
Tool-guide bushings require replacement and should be mounted in liner bushings so accuracy is not destroyed when replacement bushings are required. Bushings required for a number of related holes in one face such as for a cylinder head, oil pan, front cover, or so on, should be mounted in a plate separate from the fixture frame. This plate can then be shifted, removed for bushing replacement, and easily altered should the pattern of holes be changed.

The fixture bases must be open to get rid of chips which should fall to some form of conveyor either in the machine base or in the floor below.

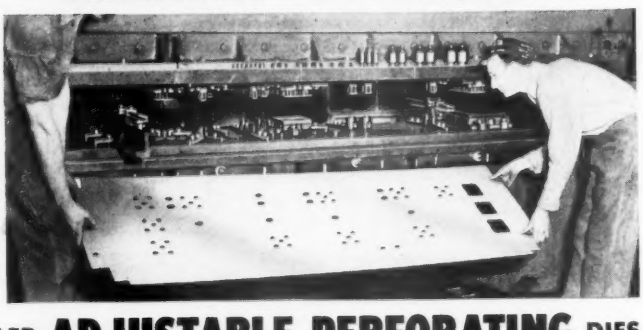
Transfer mechanisms are usually hydraulically operated and equipped with accelerating and decelerating valves in each end of the cylinders. Air can be used for transferring, turning, and loading work, but it is difficult to control because it is compressible. Irregular movement of work results. Leaks are difficult to locate as compared to oil leaks. Oil is almost incompressible; therefore, its use results in uniform motion. Acceleration and deceleration of transfer bars moving heavy work from station to station is very important and satisfactorily accomplished with suitable valving in an oil circuit.

*Partial text of Mr. Mansfield's paper presented before the 1954 Annual Meeting of the American Society of Mechanical Engineers and reprinted here through courtesy of the Society.

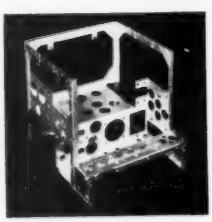
OVER 2,000 PLANTS *are making up their Metal Perforating Die Sets by Whistler methods*



WHISTLER **MAGNETIC PERFORATING** DIES



WHISTLER **ADJUSTABLE PERFORATING** DIES



- Lower die-making costs.
- Start production quicker.
- Save work handling labor.
- Increase press production.
- Versatile in job application.
- Perforate materials to ⅜" thick mild steel.
- Combine horizontal and vertical perforating operations.
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- All parts re-usable and interchangeable.
- Precision assured on short or long runs.
- Parts interchangeable right in the press.
- Magnetic dies assembled on templates.
- Adjustable dies assembled on Tee slot die sets.
- Save floor and storage space.
- Die investment not "tied up."

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WHISTLER DIES ARE CUTTING COSTS FROM COAST TO COAST

S. B. WHISTLER & SONS, INC.
748 Military Road **Buffalo 23, New York**

CIRCLE INFORM-A-GRAM KEY NO. 1121

Transfer bars that pick the work up, advance, and lower it in the next station prevent scoring the work face such as the cylinderhead contact face of a cylinder block. When such work is slid along on rails, it is sometimes necessary to take a finish cut after it leaves the transfer machine to remove scratches or scores from chips.

Tool holders must be adjustable to provide for end wear of the tools. Sets of spare tools mounted in holders adjusted to special gages insuring exact duplication of the distance from the cutting edge to the end of the spindle, reduce tool replacement time and, consequently, downtime for the machine.

Tool spindles should be rigid and run on antifriction bearings spaced 6" or more apart. The drive gears should have the teeth finished after heat-treating to equalize tooth loads and insure quiet, smooth-running gears.

Labyrinth oil seals have no contacting parts. Consequently, they do not heat, wear, or drag.

Not more than one spindle should be driven from another.

Cascade lubrication, the oil circulated by a built-in pump through tubes to all gears and bearings, is just about standard practice for multiple spindle heads.

The electrical controls for a transfer machine are no more complicated than for single [automatic-cycle] machines. Basically the controls are identical, but more are required and they are connected in series on the transfer machine.

Usual functions of a transfer-machine cycle are as follows:

1. Transfer workpiece to first station and from station to station.
2. Locate and clamp work in each station.
3. Rapid approach of tools to the work.
4. Feed tools through their cutting cycle.
5. Return tools clear of work and guide bushings.
6. Unclamp work and indicate the machine is ready for the next piece.

The control circuit should prevent the starting of any function of the cycle before the previous one is completed. Means to locate the failure of any function should be included in the circuit.

A typical transfer machine requires four circuits. The first controls a solenoid-operated hydraulic valve for the transfer cylinder. At the end of the transfer motion, the second circuit is energized. It controls a hydraulic valve directing oil to each of the work-positioning and clamping cylinders. As the workpieces are positioned and clamped, a limit switch at each station is closed. The last station clamped closes the last switch completing the circuit controlling the feed of each of the tool-carrying units.

As each unit reaches the in-end of its feed stroke, it closes a switch and again at the return end of the feed stroke, a second switch is closed; the last one completes the circuit operating the clamping cylinder valve unclamping the workpieces. As each fixture unclamps, it closes a switch, the last one completing the fourth circuit to an indicator light which shows the machine has completed its cycle and is ready for the next piece.

. . . *Continued on page 116*

A NEW CONCEPT!

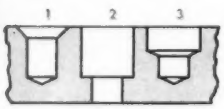
MOHAWK

Size-Optional

SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

NORMAL DELIVERY
1 WEEK
FROM RECEIPT OF ORDER

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

worlds largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 1131

NOW TROUBLE-FREE deburring & countersinking

with the NEW FORD UNIFLUTE COUNTERSINK

Engineered for maximum efficiency with simple *single flute design*, FORD'S new high speed steel Uniflute *ends all deburring and countersinking troubles* on soft stringy steels, aluminum, brass, bronze, plastic, rubber, wood and other materials. FORD'S new HSS Uniflute covers a *wide range of hole sizes with one diameter tool.* Its cutting action is effective from the working point to the major diameter. Job-engineered shear angles allow superior free cutting, insure trouble-free action, even at higher speeds.

FORD regrinding service adds tool life, reduces tool costs!

FREE information • **Bulletin HSS 408** gives complete information about Ford's new Uniflute countersink, plus easy 4-step instructions on how you can resharpen the Uniflute in your own tool room.

Catalogue No. 207 gives all facts on more than 277 FORD rotary tools including HSS ground cutters, rotary files, countersinks; CARBIDE cutters, end mills, grinding burs. **Send today!**

M. A. FORD MFG. CO., INC.
Pioneers in rotary tools for more than 30 years
817 W. River Street, Davenport, Iowa

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Specify DESTACO FEELER STOCK

For precision fitting, checking clearances, inspection and production work. Available in 12" strips, ½" wide, in cellophane, packed 12 pieces of one thickness to a box; also in 25-foot coils. 14 standard thicknesses from .0015" to .015".

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All types—to your specifications.
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Write for bulletin — No Obligation

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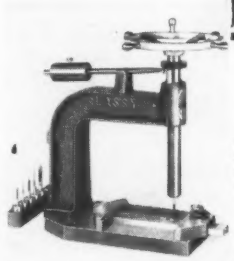

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sets new standards for accuracy, efficiency, time and taps saved.
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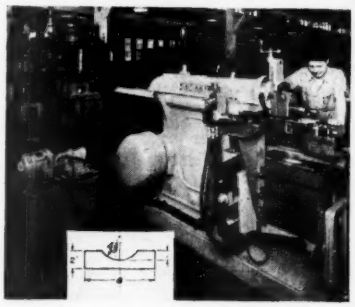
Plainville, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1144

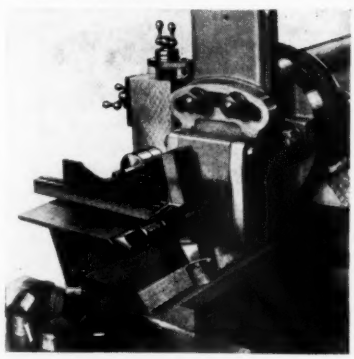
TURNPIKE SHAPER

The operation time for contour-machining bridge bearing plates in quantity has been reduced from 75 minutes each to 20 minutes by the utilization of a follower-equipped Cincinnati metal working shaper, at the Buffalo Plant of Ernst Iron Works.



Over-all view of the 24" Cincinnati shaper which, in combination with a Turchan follower, has reduced the job of profiling a bearing seat from two setups and 75 minutes to one setup and 20 minutes.

The machine, illustrated here, is a 24" heavy duty Cincinnati shaper, equipped with a Turchan automatic follower. In one 20-minute floor-to-floor operation, this shaper accurately produces a radial bearing seat that formerly required two setups and two machining operations.



Close-up showing relationship of shaper tool and workpiece to the tracer spindle and template.

Ernst Iron Works produces many of the bridges and general construction components for the highway turnpikes which are rapidly spanning the country.

For Your Future
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a single cylinder for air operation or standard 1000 P.S.I. oil service

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Phone, wire or write us RIGHT NOW!

Severance TOOL INDUSTRIES INC.

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Representatives and Distributors in Principal Industrial Areas.

CIRCLE INFORM-A-GRAM KEY NO. 1152

Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Major Vulcan Services

Engineering, Processing, Designing and Building . . Special Tools . . Dies . . Special Machines . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size . . Vulcanaire Jig Grinders . . Plastic Tooling . . Vulcan Rotary Tables.

VULCAN TOOL CO.

PRITZ STREET DAYTON 10, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1153

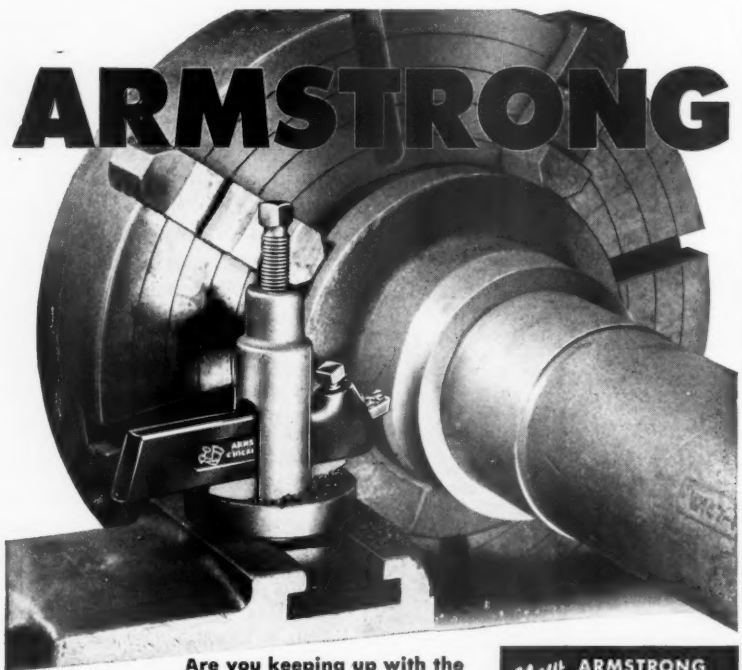
. . . Transfer Machines, from page 113

On the control station are located pushbuttons, selector switches, three sets of indicating lights numbered the same as the work stations, and one for the transfer bar, and one to indicate the completion of each cycle. These indicating lights are connected to switches at each work station which turn on the lights as each switch is closed.

If the machine stops during a cycle, by pressing a button below each group of indicator lights, the type and location of the failure causing the stop is indicated by some one light in one of the groups not being lit. As each light is numbered to correspond with a working station, the operator can determine at a glance where and what kind of trouble stopped the machine, go to that location, and correct it.

The power required by the motors driving one of these machines may total 350 hp divided among as many as 80 motors. To prevent a surge in the power lines, a "Polyflex" timer is used starting the motors at 2-sec intervals.

Selector switches can be set for automatic or pushbutton operation of any part of the cycle. The transfer can be run alone, clearing all workpieces from the machine. Clamping and unclamping may be hand-controlled and each cutting unit has start, stop, and reverse pushbuttons mounted on it for individual operation in tool changing and testing.



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-L" Tool Holders for ARMALOY Cast-Alloy Cutter-Bits

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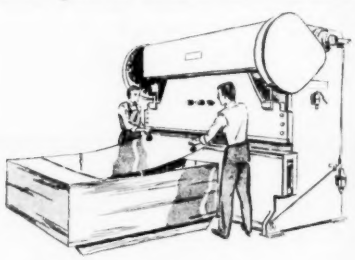
ARMSTRONG BROS. TOOL CO. "The Tool Holder People" 5220 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1161

SHEET STOCK HANDLING SIMPLIFIED

The cumbersome job of lifting ferrous metal sheets for feeding into power shears and similar



operations is simplified by the new Magic Pick-Up Tool.

The lifting element is an Alnico V magnet with a Neoprene cover set in a hi-tensil aluminum handle. The magnets are built for 20-lb, 30-lb, or 45-lb lifting capacity.

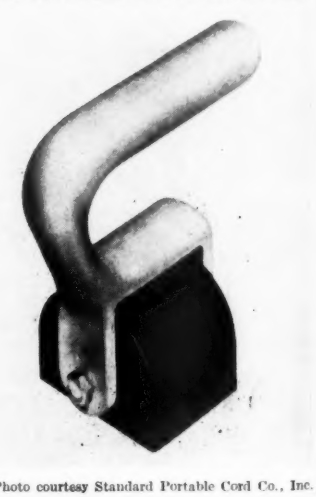


Photo courtesy Standard Portable Cord Co., Inc.

In addition to simplifying the lifting job, the hazard of operators cutting their hands is eliminated.

GROWING PAINS

A.I.T. Diamond Tool Co. has built a new plant and office building in Skokie, Ill. With the additional space, the company reports, not only will larger tools be manufactured, but a more extensive experimental program can be carried out.

◆

Cole Carbide Industries, one of the nation's oldest carbide cutting tool firms, are now operating in their new, ultra-modern plant in Royal Oak, Mich.

◆

Now under construction is **Westinghouse Electric's** multi-million dollar plant for the development and pilot production of new metal alloys and special castings at Blairsville, near Pittsburgh, Pa. The plant will provide facilities for basic metal-working processes and in addition will be equipped for such newer foundry techniques as investment casting and shell mold casting.

◆

The Mercast Corporation is constructing a new plant in La-Verne, Calif., near Los Angeles. The facilities, which are expected to be in full operation early this year, will total 12,500 sq. ft.

◆

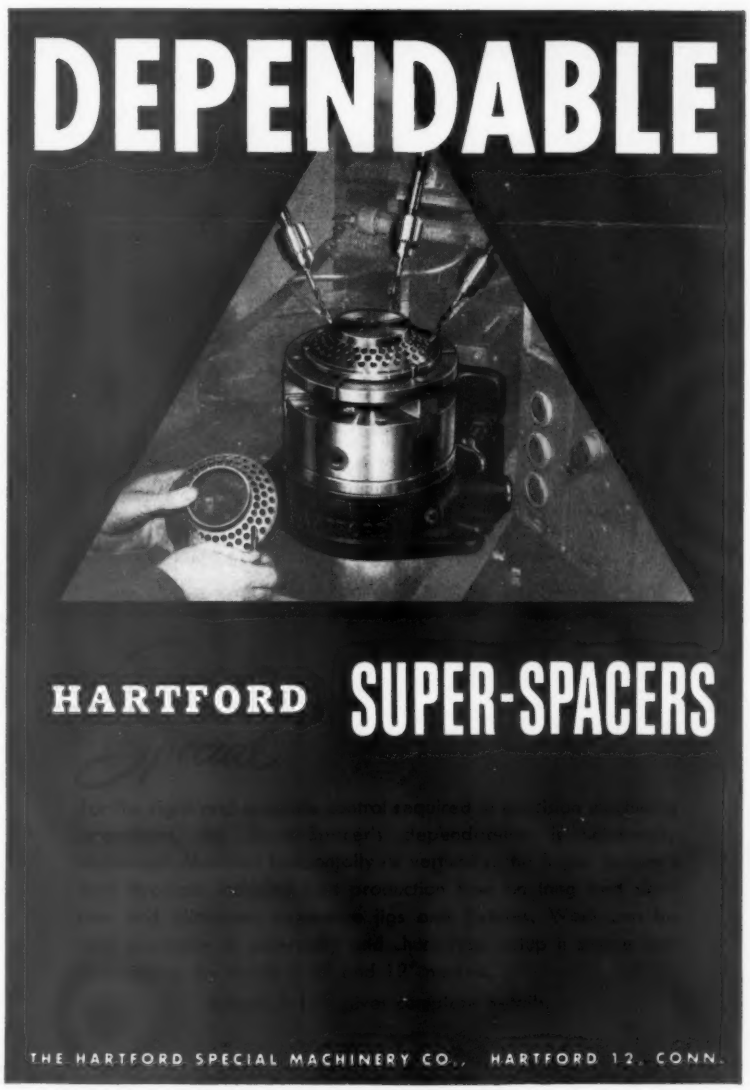
Industrial Crane & Hoist Corporation, Chicago manufacturer of overhead cranes, jib cranes, and monorail systems, is now occupying new plant and office facilities. The company has more than doubled its manufacturing capacity with this move.

◆

The first segment of **Townsend Company's** new plant at Ellwood City, Pa., is now under construction. This section will provide 81,000 sq. ft. of manufacturing space and will house some operations now carried on in the old plant at nearby New Brighten.

General Electric's Industrial Heating department, currently located at both Schenectady, N. Y., and Pittsfield, Mass., will soon be moving into a $5,000,000 plant at Shelbyville, Ind. The department manufactures industrial furnaces, induction heating equipment, and heating devices. G. E.'s Specialty Control Department is now building a new plant for the exclusive production of special control equipment.

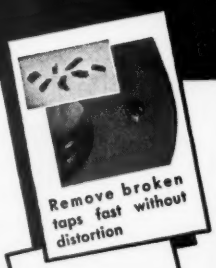
Recent additions in equipment and the expansion of production facilities have placed the Aircraft Division of the **Ledkote Products Company of New York Inc.,** in the forefront as a producer of aircraft metal stampings and assemblies. The company's new 15,000 sq. ft. Kirksite foundry has been completed and three new Cecostamps installed, bringing the total of all drop hammers in operation to 20.

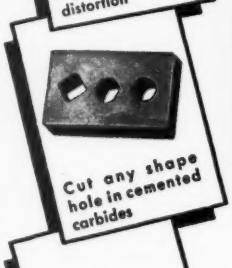


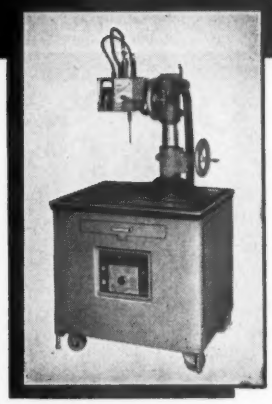
CIRCLE INFORM-A-GRAM KEY NO. 1171

METAL DISINTEGRATION

and what it can do for you

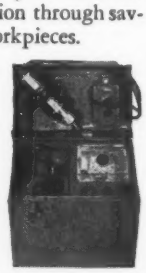






Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.



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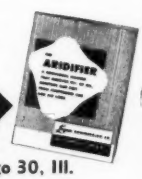

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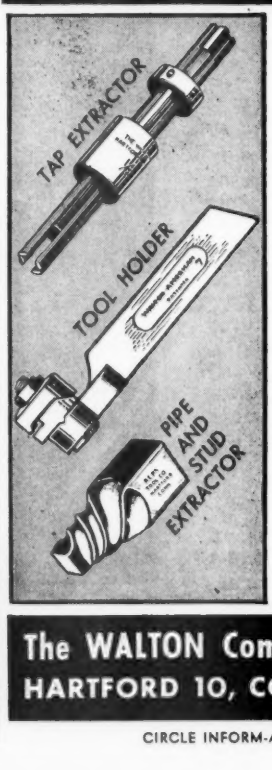

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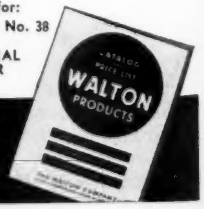


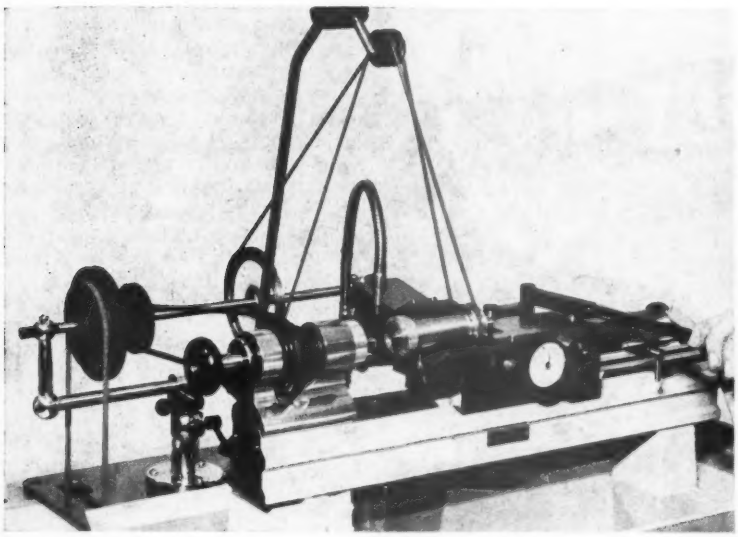
The WALTON Company
HARTFORD 10, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1183

A New Approach to Micro-Drilling

The drilling of smaller and smaller precision holes is an operation which is becoming more commonplace in shops doing fine instrument work. Although the general principles of drilling apply equally to large and small holes, there are differences in technique.

Micro-drilling concerns holes smaller than a No. 60 drill. Hence, making a proper center in which to start a drill becomes a problem because there are no ready-made center drills available for such work. If the hole is relatively deep and of very small diameter, it is almost impossible to get coolant into the hole; so, except at the start, for all practical purposes the drilling must be done dry.



The tolerances, both as to diameter as well as runout, must be held closer than in the case of large drills. Furthermore, when drilling very small holes in tough materials one is limited by the actual strength of the drill itself.

In the conventional methods of drilling the operator applies pressure directly to the drill in accordance with rate of cutting. Thus the work is dependent upon the operator's sense of feel. It frequently happens that a small drill will not stand even this "sensitive" pressure and the drill simply buckles and snaps off.

The drilling device shown here in use on a jewelers lathe, was developed primarily for micro-drilling operations. It has been successfully used for drilling holes as small as 0.0016" and does not call for any unusual skill on the part of the operator. As another example of work done with it, a 0.023" hole was drilled through a piece of drill rod 1.062" long and the total indicator runout was less than 0.0002".

When using drills which are only a few thousandths of an inch in diameter it is impractical to use a drill jig bushing or a centering tool. Therefore, it is necessary to start the hole directly with the drill. Obviously the surface of the work must be so smooth that the drill point will not be deflected by tool marks, and the drill must be absolutely centered with the work. In the case of a drill as small as the one mentioned above (0.0016") a misalignment of only 0.0001" becomes serious.

The spindle of the drilling attachment is mounted on a pair of adjustable slides. By means of the slides it is possible to quickly center the spindle on any lathe on which the attachment may be used. The centering is done as follows: In both the lathe head and the drilling spindle there is chucked a small rod terminating in a short pivot of only 0.004" diameter. The two pivots are brought end to end and the centering slides are adjusted until under a strong magnifier the two pivots form a single hair line. This can be done in less than a minute and with extreme accuracy. . . .

Continued on page 122

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INFLUENCE OF "AUTOMATION" ON MACHINE-TOOL DESIGN*

by F. R. Swanson
Director of Engineering
SUNDSTRAND MACHINE TOOL CO.
Rockford, Illinois

IT IS APPARENT that the machine tool has advanced from a comparatively simple machine, controlled by an operator, to a highly automatic machine that should perform its operation continuously as reliably and with as little attention as an automatic watch.

To design a machine tool today requires the close cooperation of a group of engineers with imagination, engineering knowledge, and training in the various phases of machine-tool elements.

Considering the design of a standard single-unit machine to which automation may be applied, thought should be given to the machine base to provide ample room for chip conveyors. Machine ways should be either heat-treated or non-metallic, protected from chips and automatically lubricated to provide continuous operation with a minimum amount of attention. The base also should be designed in such a manner that it will lend itself to the application of automatic work-handling devices.

In a multiple-station machine, the base is usually designed to receive a stationary fixture having chip channels that will allow the chips to flow freely into a chip conveyor in the foundation. The automatic work-handling equipment is tailored to fit into the base and fixture as a unit.

The various stations usually have sliding heads on wing bases. These bases should be equipped with heat-treated or non-metallic ways, protected from chips and automatically lubricated from a central lubricating system. When lubrication is automatic, there is a tendency on the part of the maintenance men to neglect periodic inspection of the points of lubrication; therefore, it is important to provide a signal in case of any failure in the system.

A very important point to consider in a multi-station machine is accessibility. The machine units should be spaced far enough apart to provide room for changing cutting tools and for the setup men to observe the cutting tools in operation.

Grouping of operations and number of units in each section of the machine is usually determined by the customer's process men. However, similar operations such as drilling, milling, boring, etc., can be grouped in a section. This makes possible shorter sections with a stacking station between sections so the work can be stacked or shuttled past a section that may be down for repair or tool change. It also provides space for checking equipment for the operations completed and a positioning unit to position the work for the following operations. If future product changes are anticipated, idle stations are usually provided where additional machine stations can be added without disrupting the entire machine.

*Partial text of paper presented before the 1954 Annual Meeting of the American Society of Mechanical Engineers and reprinted here by courtesy of the Society.

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5 TON Bench Model
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15 TON
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When multi-station machines perform a number of operations automatically, it is necessary to apply automatic gaging to control the necessary machining limits or as a check to guard against broken taps or drills. When automatic gaging is used, it is then necessary to incorporate in the design of tool holders, spindle head and feed units, features that will make it possible to translate the gage signal to stop the machines, adjust the tool or insert a sharpened tool, or reject the part as directed.

Regardless of the type of automatic machine, whether a single machine or line of self-loading machines, certain basic requirements are necessary for good control. As the control becomes more complex, the means by which these are met must change. These requirements are:

(a) Safety for the operator and maintenance men.
(b) Safe failure of components with respect to the machine and workpiece.
(c) Long life of electrical components.
(d) Ease of maintenance.
(e) Simplicity and flexibility of control for the operator.

On a single machine all the pushbuttons are usually mounted at one point. The operator then uses one button to start the motors and another to start each cycle. Each part of the machine operates individually for setup.

When a number of machines are put together to form a line of self-loading machines with only one or no operators, the pushbutton aspect of control becomes different. The machines may be arranged to work in several groups so that one group, if down, may be by-passed. This may require units between the groups which may direct the work to another conveyor. It also requires that each group be capable of operating either alone or with the next group. Then the control for each group must be completely separate from the others. If there are loading units between groups of machines, they must be run from a separate control which may be switched to operate with either group.

Each group then must be set up on the principle of a machine loading and cycling only if its unload station is empty and its load station is full. This principle can be applied to any number of machines in a line. To keep the control separated, two limit switches may be used in a station between two machines—one connected to the first machine to prevent its shuttling if the station is loaded, and the other connected to the second machine indicating when the part is ready to be loaded.

The operator then must be able to run all or any group of machines he desires in either manual or completely automatic control. Here machine design can greatly assist the flexibility of control. This can be done if two adjacent groups of machines are designed so that their mechanical work-handling mechanism cannot possibly interfere. This will allow each to run completely independent of the other.

Perhaps the most eminent single item that may affect future designs will be the increased application of electronic computers, digital converters and various feedback systems to the controls of automation in all its phases such as the machine tool itself, work-handling, accumulation of gaging data, programming, etc.

Scully-Jones *precision built* Arbors and Adapters save costs two ways!

For fast, accurate milling at lower cost, it pays to use Scully-Jones *precision built* Arbors!

You save tool life because your cutters always run true, each tooth taking its share of the load. Arbor and pilot diameters are held to +.0000", —.0005". Faces of spacers and sleeves are ground and lapped parallel within .0002". Taper shanks are ground to a finish of from 10 to 20 micro-inches, RMS, and are individually checked on light gages to assure a perfect fit in the spindle.

You save tooling costs, too, because Scully-Jones Arbors are made to take a lot of punishment. Manufactured from steel forgings, they're tough on the inside to provide maximum strength and minimize vibration . . . hard on the outside to resist nicking and wear.

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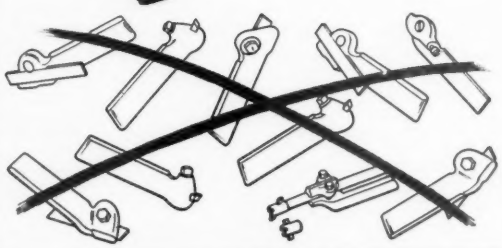

This Universal Tool Holder can be used for any lathe, shaper or planer set-up, does internal boring and threading, is ideal for carbide tools. Bit sizes: ¼", 5/16", ⅜", 7/16", ½", ⅝".
Furnished with Cobalt Bits

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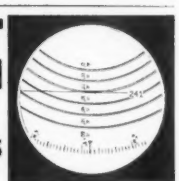
Optical Dividing Head
Optical Rotary Tables
for PRODUCTION and CONTROL



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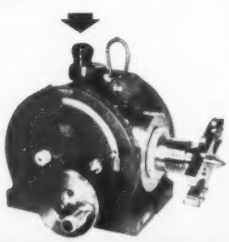
DIVAS— DIRECT READING IN SECONDS
DIVAO— GRADUATION IN MINUTES
Max. swing—10", Size—16" x 11½", height—13", Load on spindle—500 lbs., Weight—186 lbs.



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CIRCLE INFORM-A-GRAM KEY NO. 1223

. . . Micro-Drilling, from page 119

As the operator applies drilling pressure to the lever on the feed slide, he finds that the slide is restrained by a stop screw. The stop screw has a graduated dial, and the slide can advance only as the dial is turned by the operator. When the slide is retracted to clear the chips from the drill, it can be returned to the exact position where the drill ceased cutting without the danger of having the drill strike the bottom of the hole.

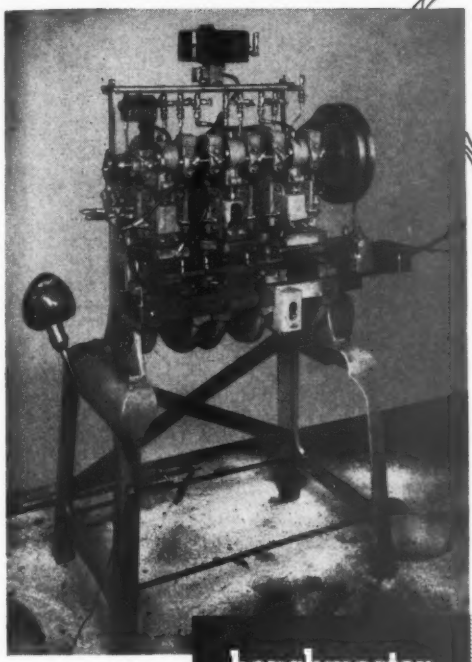
A second adjustable stop screw is provided to control the final depth of the hole. The dial indicator enables the operator to watch the progress of the drilling. It may also be used to indicate the point at which the drill first contacts the work.

Since so much of this work is done without benefit of center drilling, it is advisable to use the so-called "pivot drills" or watchmakers drills. This type of drill has an over-size shank and is exceptionally rigid for its size. When the depth of the hole exceeds the flute length of a pivot drill it is used only for starting, and the hole is finished with a regular twist drill. If the hole is smaller than the smallest commercially available twist drill there is no recourse but to use a pivot drill and the hole depth is limited by the length of the flutes.

APPRENTICE PROGRAM MERITS AWARD FOR NTDMA

A "Grand Award" for outstanding public service — based on its development of an apprenticeship training program — was presented to the National Tool and Die Manufacturers Association during the opening sessions of the recent American Trade Association Executives convention in Los Angeles.

Leading the class of national organizations with annual budgets between $50,000 and $150,000, the National Tool and Die Manufacturers' citation was for: "Its very meritorious accomplishment in arranging for apprenticeship training and allied programs in this vital to National Defense industry."



3 benchmasters

on a single crankshaft triple press output, reduce investment!

These 3 small, 4 ton Benchmasters are now doing the job of *one large press*, at a fraction of big press cost. Production is three times greater, die maintenance easier, downtime reduced next-to-nothing.

Originally the progressive die used was of one-piece construction. The first stage required frequent sharpening, necessitating complete shutdown and dismantling. Die is now divided into 3 components, each successive stage on its own Benchmaster.

When the first stage needs sharpening, a duplicate die is inserted. Press time is almost continuous, die hazards are greatly reduced. Instead of 100 strokes per minute on the old press, the Benchmasters run at approximately 300 rpm—with tripled output! This is another case of reduced costs and improved production with Benchmasters—first choice in small punch presses and mills!

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CIRCLE INFORM-A-GRAM KEY NO. 1231

compare YOUR drill fixture COSTS with ANCHOR BUSHING templates

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Your TOOLING COSTS are reduced in simplified design and fabricating methods. Your MATERIAL DOLLARS go further by using inexpensive hardened steel Anchor Bushings and sheet metal or plastic materials. Your PRODUCTION JOB TIME is conserved since lightweight Anchor Bushing templates reduce worker fatigue and storage problems.

Compare your drill tooling methods, as have leading aircraft tooling departments, with the Anchor Bushing Method.

Ask today for our Anchor Bushing Catalog – it describes methods, bushing styles, sizes and prices.

Solar Aircraft Company, San Diego, craftsmen use contoured Anchor Bushing drill template on nacelle of Lockheed P2V Neptune aircraft.

Standard Anchor Bushings for rivet or spot weld attachment to sheet metal or fiberglas.

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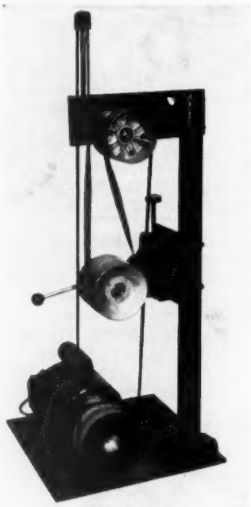
CIRCLE INFORM-A-GRAM KEY NO. 1232

Tongue Sander is Ideal for Small I. D. Work

A machine offering a great variety of applications is the tongue sander designed for the small I.D. sanding of miscellaneous metal parts. In and around the Indianapolis area, several plants are successfully producing finished work on these machines.

Specifically, the tongue sander is now being used to sand the I.D. of bomb straps, cut-outs, horn rings, jeep gas tank necks and the like.



Successfully used for sanding the flash in the rings of forged tin snips is this tongue sander.

Inside contours on tin snips are blended on a tongue sander which uses a ½" Metalite cloth belt.

The model pictured above was built by the Behr-Manning Corporation and has been successfully used to sand the flash in the rings of forged tin snips. It uses a ½" x 132", 80-X Resinall Metalite cloth belt; and, because the nose pulley is only ⅞" in diameter and 9/16" wide, it is easy to see no difficulty was encountered in sanding the 2-3/8" long by 1-1/4" wide ring in the tin snips. To allow greater work pressure, a small platen was placed in back of the belt.

In many applications, Behr-Manning found it unnecessary to use a nose pulley bearing as small in diameter (7/8") as the 38 KTT Fafnir bearing which was used on the model pictured here. So, bearings of greater diameter were tested and it was reported the larger the diameter, the less bearing trouble users of the tongue sander will encounter.

In the event belts wider than 1/2" are considered for use, it is recommended that two bearings be pressed into a crowned sleeve to be used as the nose pulley. When a single bearing is used as the nose pulley, Behr-Manning grinds a crown into the outer race to facilitate belt tracking. The belt, also, is twisted over the backstand idler pulley to prevent the grain side from abrading the pulley.

Power for the tongue sander is furnished by a 1725 rpm, 3/4 hp single phase, 110-220 volt, AC, fully enclosed motor which was used with a 5-1/2" diameter pulley that generated 2600 sfpm belt speed.

Monsanto Film Shows Progress of Shell Molding

Recent progress in techniques of shell molding is the subject of a new 18-minute picture available from Monsanto Chemical Company's Plastics Division.

The black and white film traces the development of resin shell binders and describes techniques of shell production, shell assembly, and casting. It covers a wide range of shell production methods from crude manual operations to those involving huge multi-station machines which require manpower only for inspection purposes.

Emphasizing shell molding progress which has been achieved through the joint efforts of the foundry, the equipment manufacturer and the resin supplier, the film is suggested for showings to sectional society meetings, foundry personnel, and school and college groups.

Requests for the film may be directed to Monsanto's Plastics Division, Department SM, St. Louis 4, Mo.

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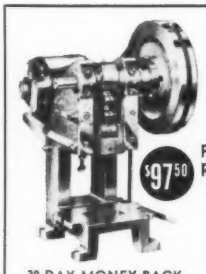

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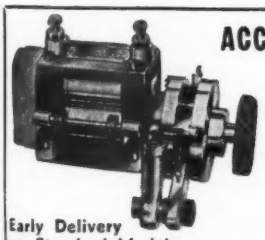

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"RFC" ROLL FEEDS are quality built for long, dependable service.
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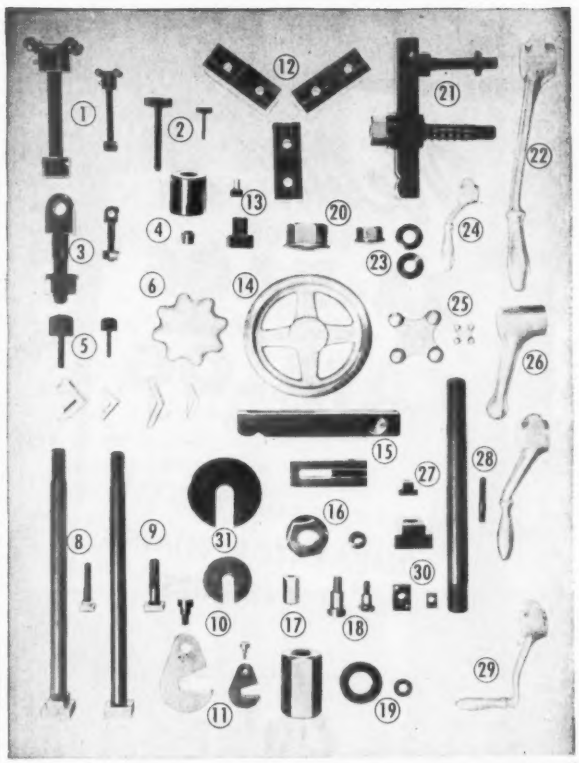
ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electric Affiliate

CIRCLE INFORM-A-GRAM KEY NO. 1253



OVER 500 JERGENS STANDARDS SAVE TIME--LABOR--⅔rds THE COST

Illustrated above are just a few of the more than 500 Jergens Standard Jig & Fixture Components. One of the most complete lines in production today, mass-produced Jergens Standards save you the skilled tool and die room help necessary for the custom making of component parts in your own shop. Keyed to the photograph and listed below is a brief description of a number of these items now immediately available from stock. Write for descriptive catalog and price list.

1. Clamp Shoe Assemblies—14 sizes—alloy steel screws—hardened steel shoes with snap ring lock.
2. Thumb Screws—4 sizes—3 lengths each size.
3. Latch Screws—4 sizes—hardened.
4. Jig Rest Buttons—4 sizes—hardened—ground.
5. Quarter Turn Screws—9 sizes—soft steel.
6. Palm Grip Hand Knobs—with reamed, tapped, or square hole.
8. Tee Slot Bolts—standard sizes ⅜" to 1" —various lengths.
9. Tee Bolts—standard sizes ½" to ¾"—various lengths.
10. Shoulder Screws—for use with swing "C" washer.
11. Swing "C" Washers—4 sizes—comes with shoulder screw.
12. Blank Soft Chuck Jaws—19 standard sizes—S.A.E. 1020 Steel—in stock to fit approximately 273 master chucks at a moment's notice—special blanks made on request.
13. Rest Buttons—4 sizes—hardened—ground.
14. Hand Wheels—4 sizes 6" to 12" in diameter—aluminum alloy.
15. Strap Clamps—hard and soft—plain or with radius.
16. Flange Nuts—9 sizes—hardened.
17. Extension Nut Couplers—8 sizes—alloy steel.
18. Shoulder Screws—24 sizes—Hex head socket—160,000 to 180,000 P.S.I.
19. Plain Flat Washers—8 sizes—hardened—ground.
20. Spherical Flange Nuts—9 sizes—hardened—ground.
21. Strap Clamp Assemblies—comes with spherical flanged nut assembly or hand knob for clamping the strap.
22. & 24. Offset Handles—aluminum alloy or malleable casting.
23. Spherical Washers—hardened—ground.
25. Hand Knobs—aluminum alloy casting.
26. Clamping Levers—aluminum alloy or malleable casting.
27. Tee Nuts—14 sizes—hardened.
28. Studs—stress-proof steel.
29. Crank Handles—aluminum alloy or malleable casting.
30. Fixture Keys—(hard or soft)—ground.
31. "C" Washers—22 sizes—4, 5, and 6 diameters each size—ground.

Jergens BETTER TOOLS AT LOWER COST
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GAGE COMPANY

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The MICRO-PROJECTOR with the VERTICAL DESIGN

• New Gage Company Precision Plastic Comparator Charts made on non-changing, unbreakable material; available for 360° angular checking, radii, threads and special charts to your specifications. • The Wilder so equipped will inspect faster, more accurately, without the need of to-scale manually built drawings.

Economy • Accuracy • Moderate Price

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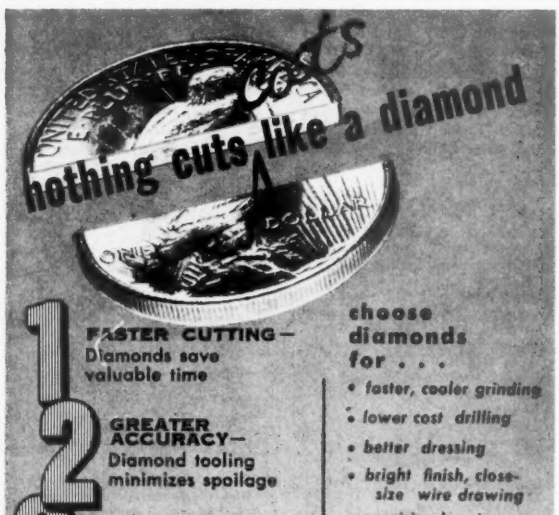

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GREATER ACCURACY— Diamond tooling minimizes spoilage

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- better dressing
- bright finish, close-size wire drawing
- precision lapping
- accurate cutting and boring
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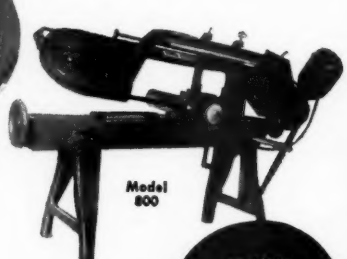
CIRCLE INFORM-A-GRAM KEY NO. 1263

NOW Wells offers you fool-proof blade tensioning . . .

Above is a close-up of the new Wells blade tensioning device.



on Wells No. 5, No. 8, No. 12 and Model 800 cut-off saws

NOW IT IS POSSIBLE to maintain a constant blade tension on Wells cut-off saws. You can replace or change the blade any number of times, yet quickly and easily duplicate the correct blade tension. The new device is standard equipment on the models listed above. Simply turn the tension hand wheel until the fixed and moving indices coincide. At this point the blade tension is correct regardless of variation in blade length.

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORP.

1940 CEDAR ST. • THREE RIVERS, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1264

STANDARD MACHINE TOOLED FOR SPECIAL PURPOSE

The Nylok nut is very similar to a standard hex nut except that a round nylon slug is inserted through a hole in one flat face. The slug is staked in place, with the inner end of the nylon extending just beyond the minor diameter of the nut. The

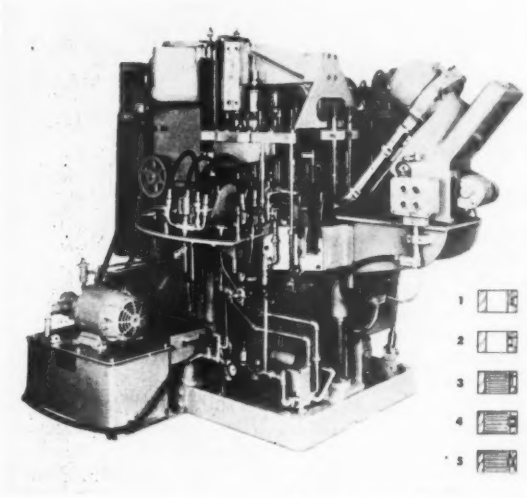


Photo courtesy of The Bodine Corp.

nut locking action is obtained by the nylon slug being forced into the threads of the bolt.

The original method of producing these nuts on two separate and different types of machines proved uneconomical for volume production. The problem was to devise a machine which could complete all necessary machining and assembly operations on the cold headed nut blanks in one automatic cycle.

A solution was found by tooling a standard Bodine dial type drilling and tapping machine to perform this sequence of operations. The nut blanks are dumped into a hopper with a double track feed. They are automatically fed, positioned, and transferred to the dial, two nuts per stroke of the machine. All operations are performed in duplicate, hence the machine completes two nuts per cycle.

The 5-step sequence of operations is shown in the illustration:

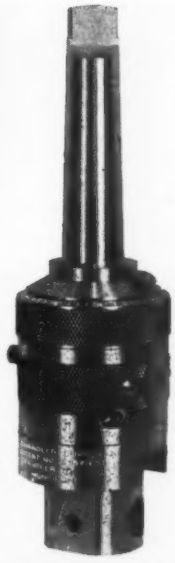
1. Horizontally drill hole, slightly larger than diameter of nylon rod, halfway through wall of one face.
2. Horizontally drill remainder of hole through wall at a diameter slightly smaller than the nylon rod.
3. Tap class 2 thread through nut, removing burr left by the drilling operation.
4. Shear off nylon slug, automatically position it, and insert it in drilled hole.
5. Hydraulically stake nylon slug to proper depth. The nuts are then automatically ejected.

. . . *Continued on page 130*

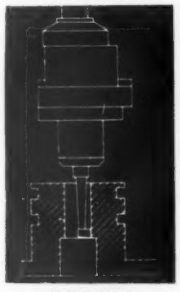
A Boring Head That Won't Face is NOT Complete

CHANDLER-DUPLEX Does ALL IN 1 SET-UP

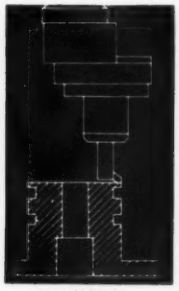
BORING
FACING
TURNING
GROOVING
UNDER-CUTTING



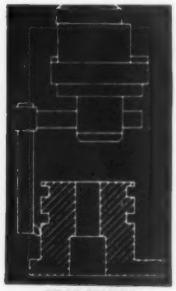
The CHANDLER-DUPLEX Combined Boring and Facing Toolhead has many features not found in ordinary makes . . . such as power feed for facing, longer slide travel, extremely fine adjustment, tee slot positioning of cutting bar, universal range and adaptability.



BORING



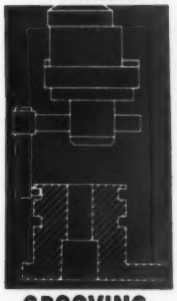
FACING



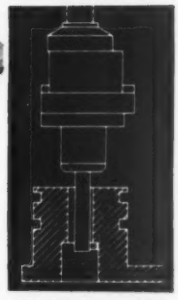
TURNING

CHANDLER-DUPLEX *combines* boring and facing — permits all these operations in one set-up. Built for efficiency, accuracy and stamina.

A Model for Any Size Machine



GROOVING



UNDERCUTTING

Write today for full details and Catalog on this combined Boring and Facing Toolhead

CHANDLER TOOL CO.
Muncie, Indiana

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

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480 (AD-50)

All collets in hexagon, square and round.

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LEVER-TYPE DRAWBAR ½" cap.

Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

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No metal or material will load the Stone, even stock removed from aluminum or carbon is easily wiped away with an oil wetted cloth. Reconditioning when required is easily done in your own shop.

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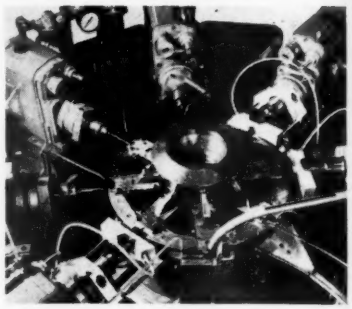
Sales Agency for SCIENTIFIC ABRASIVES (not inc.)

CIRCLE INFORM-A-GRAM KEY NO. 1282

Sliding Sub-Bases Make Versatile Drill Units

The recent development of several drill unit accessories represents another step toward standardization of principle elements incorporated in the design of special purpose machines. The cost of such machines can thereby be reduced.

The sliding sub-base manufactured by the Drill Unit Division of Rockwell Manufacturing Company is one of these accessories. It increases the versatility of standard air-hydraulic drill units.



Use of these bases makes it possible for special-purpose machines incorporating drill units to be built in such a way that the units themselves can be moved forward and back with relation to the parent machine without loss of machine alignment.

This feature facilitates removal and replacement of tools, thus greatly reducing time expenditures for tool changes and repairs. It also saves time and effort in making setup adjustments where the machine is designed for work on a wide range of part sizes. These adjustments can be made without disrupting accurate machine alignment.

Adequate length of travel is allowed for in each of the three sub-base models — 4⅛" for the small model, 6" for the two larger sizes.

For further information write Drill Unit Division, Rockwell Manufacturing Co., 434 North Lexington Ave., Pittsburgh 8, Pa. **Circle Inform-A-Gram No. D1.**

Van Norman-C.I.T. Offers "P-A-Y-D" Machinery Plan

The Van Norman Company, machine tool builders of Springfield, Mass., has announced a "radically new" merchandising plan featuring long-term leases, and a 10-year installment sales plan geared to match the new, faster depreciation schedules.

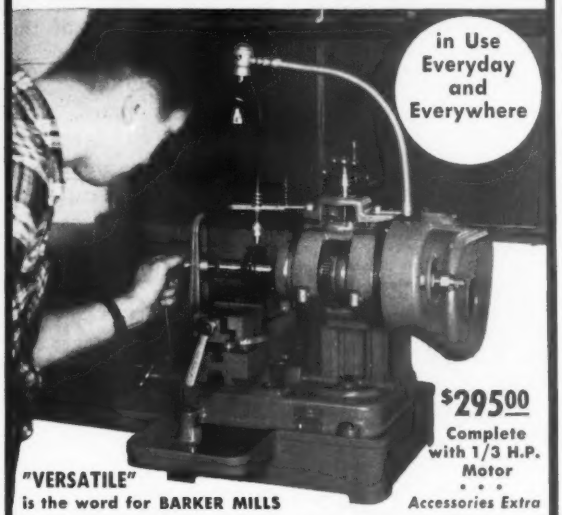
James Y. Scott, president, said the new program, one of the most complete ever offered buyers of machinery, was developed with C. I. T. Corporation, industrial financing subsidiary of C. I. T. Financial Corporation.

Buyers can now choose any of five ways to acquire Van Norman machinery: (1) a straight cash purchase, (2) a lease plan running to nine years under which monthly rentals can be written off as expense, (3) a lease plan with an option to buy, (4) an installment plan with equal monthly payments and terms running to five years, or (5) a Pay-As-You-Depreciate (P-A-Y-D) plan with terms of up to 10 years and payments geared to match depreciation allowances under the new tax law.

Scott pointed out that the P-A-Y-D plan was tailored to the so-called sum-of-the-digits method of depreciating equipment, the fastest method allowed. Using the sum-of-the-digits method of depreciation, the owner of a machine which could be depreciated in 10 years would add the actual digits 1, 2, 3, and so on to 10 for a total of 55, Scott said. Then inverting the digits, the owner could charge 10/55 of the cost to depreciation expense in the first year; the second year, 9/55; the third year, 8/55, and so on until in the last year, 1/55 would be written off.

Payments under the P-A-Y-D program will be made monthly, Scott said, but will total during any year approximately what the machine owner can "expense off." This, he said, makes it possible for machinery users to write off payments and makes the relationship between the rate of payment and depreciation reserves "a realistic one."

★ MORE BARKER MILLS in MORE PLANTS on MORE JOBS



$295.00 Complete with 1/3 H.P. Motor

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Accessories Extra

"VERSATILE" is the word for BARKER MILLS

Tested Design and Unusual Operational Features are Boosting Barker's Popularity with machinists and plant executives by leaps and bounds. More than a thousand in use already in diversified industries and on various machining operations. Satisfaction that prompts repeat orders is one of our strongest claims. Investigate the BARKER before you buy. We know the BARKER MILL can work wonders in your tool room or on your production line.

Write for Details. **BARKER ENGINEERING CO.** 500 GREEN ROAD CLEVELAND 21, OHIO

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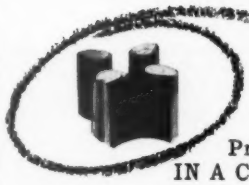

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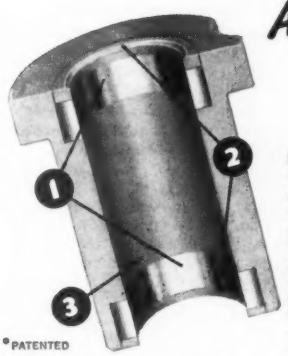

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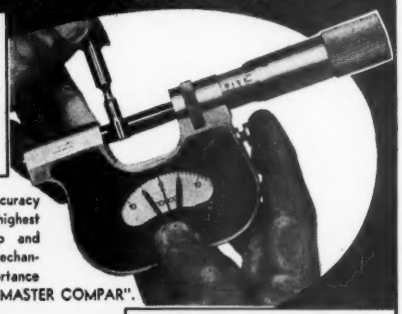
INDICATING MICROMETER COMPARATOR

has the VISIBLE feel

No Arguments as to correctness of reading due to "feel". Use it as Comparator, Master Micrometer, Go & No Go Gage. 1" Range reading in 1/10,000"



To attain permanent accuracy at these close limits, highest precision workmanship and exclusive design of mechanism are of Major Importance and ONLY found in "MASTER COMPAR".

A RIGHT HAND TOOL

Release button for movable Anvil on RIGHT Hand side enables you to hold tool the conventional way.

NEW— Resetting to Zero in 5 seconds

Quick adjustable tolerance hands.

Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Ovalness & Taper.

0-1" SIZE IN HARDWOOD CASE $95.00

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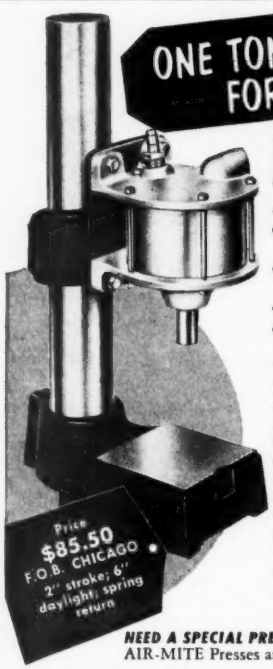

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CIRCLE INFORM-A-GRAM KEY NO. 1302

. . . Special-Standard Machine, from page 127

An electrical inspection device is incorporated in the machine which checks for: broken drills; and proper cutoff, insertion, and staking of the nylon slug.

Because the machine is entirely automatic, one operator runs a battery of three machines. Production rates vary from 1,400 to 3000 pieces per machine per 50-minute hour, depending on size of tapped hole. Interchangeable tooling permits the same machine to be used on various nut sizes.

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CROBALT cast alloy cutting tools outwear and outproduce HSS . . . withstand shock and vibration far better than carbides . . . give 15% to 35% more pieces per grind than other cast alloys! They've been proven through 23 years in the largest metalworking plants; and today they're better than ever. Try them and see!

FREE CROBALT BULLETIN

describes the conditions where cast alloy tools are BEST — and tells how to use them to full advantage. In it, you may find the way to higher production at lower cost. Write for *Bulletin 101*.

DISTRIBUTORS: We invite your inquiries.

Crobalt, Inc.
2800 S. State St., Ann Arbor 5, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1312

THE RECORD BREAKER..

M-B "JUNIOR" 75000 R.P.M. PNEUMATIC GRINDER

Model M-CR-B

"JUNIOR" Does a Man's Size Job!

A smaller but husky model that can be used on many operations where a lighter weight tool is advantageous. Stays on the tough jobs day in and day out. 4 TYPES: 2 types of spindle extension; 2 types of air control valves; steel body; grease-sealed bearings; light weight, 12 ounces. Accommodates mounted grinding wheels, rotary files, etc. SPEEDY—Will operate Tungsten Carbide Burs, Rotary Files, etc. to their full efficiency.

Write for Literature

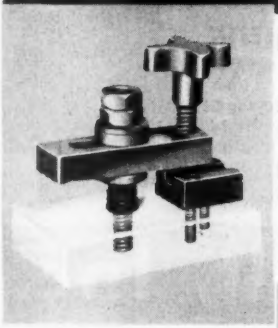
M-B PRODUCTS
46 VICTOR AVE., Div. 18
DETROIT 3, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1314

Specify

Morton

FIXTURE CLAMPS AND COMPONENTS



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SAVE TOOL and DESIGN COSTS.

LARGEST ASSORTMENT IN THE INDUSTRY.

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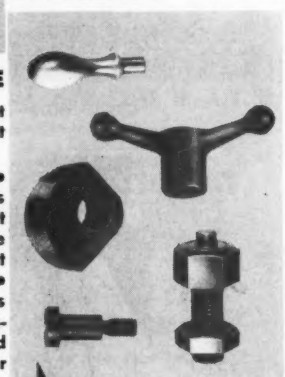
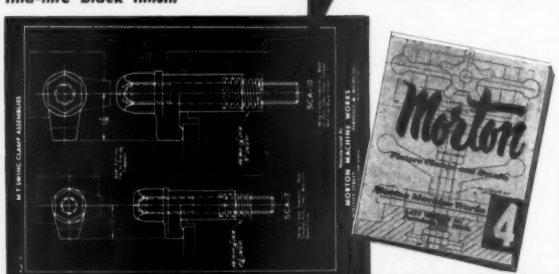
FIXTURE CLAMPS • widest range of sizes and types to fit every requirement.

Jack Locks • Cam Locks • Hand Knobs • Hand Wheels • Steel Ball Handles • Soft Chuck Jaw Blanks • Fixture Cams • Set-up Studs • Rest Buttons and Rest Pads • Spherical and Plain Collar Nuts • Quarter Turn Screws • Fixture Keys • Spherical and Flat Washers • Shoulder Screws and many other items. Complete Assemblies or Individual Parts.

All precision made of heat-treated, selected steel, cadmium plated and corrosion resistant mid-nite black finish.



J... select the Clamp or Com-p... that fits your need . . . t... into your design. Full size t... of each product, bound i... leaf style for easy re-m..., available upon request.



MORTON MACHINE WORKS

2425 WOLCOTT ST. DETROIT 20, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1321

YESTERDAY'S PIONEER . . . TODAY'S LEADER

Patent Applied For

WELDON

COUNTERSINKS and DEBURRING TOOLS

With Single Cutting Edge

Revolutionary! Chatterless!

• Greater ease in cutting is the outstanding feature of these new cutting tools—made for 82° angle countersinking and for 90° angle deburring operations. Have only a single cutting edge which prevents chatter. Both tools are regularly made for right hand cut. One trial will convince you. Special tools of this type made to order.

Write for further details.

WELDON Distributors throughout U. S. A. and Canada carry complete stocks to serve you

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1322

MEEHANITE® MOLDS

USED FOR...

Automobile Intrument Panel of Fiberglass. Shown by courtesy of Molded Fiberglass Body Co., Ashtabula, Ohio.

FIBERGLASS AUTOMOTIVE AND APPLIANCE PARTS

● Meehanite tops the list of cast mold materials for Fiberglass parts, because of its unique combination of physical properties.

It can be cast in intricate shapes with minimum finish.

The metal is clean and dense—there are no porous areas. It will take a high finish.

Trim edges can be flame hardened to outlast hardened tool steel inserts and you save the price of the inserts.

The castings are pressure-tight—no leakers.

The price of Meehanite castings is reasonable and deliveries are prompt. Not only that—but you can get castings in any size up to 20 tons in weight.

If you are interested in fiberglass or plastic molds or any other high strength iron application, let us discuss them in detail in a personal interview.

FULTON FOUNDRY & MACHINE CO., INC.

East 75th & Morgan Avenue Cleveland 27, Ohio Phone MI 1-8400

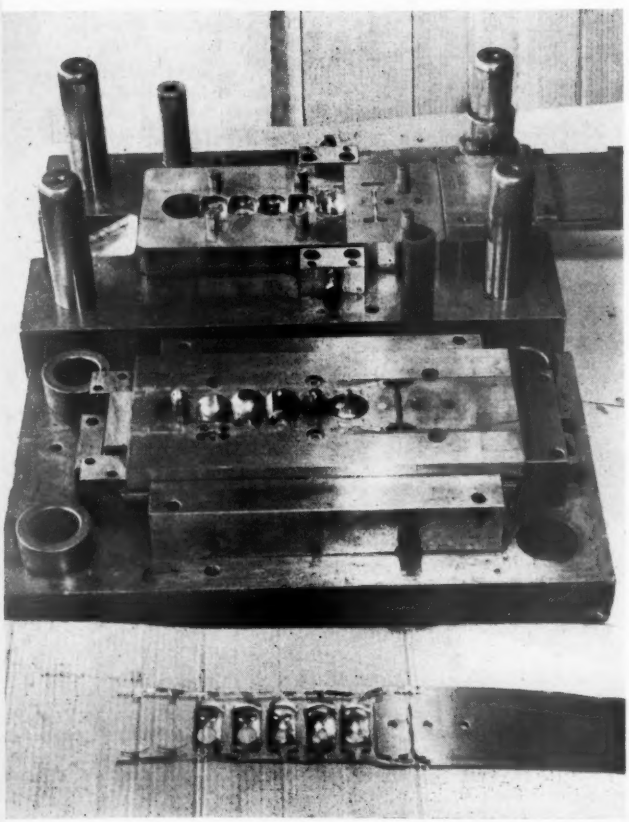
EQUIPPED FOR HEAVY, MEDIUM OR LIGHT JOBBING PRODUCTION

HEAVY JOBBING MACHINE SHOP—METALIZING

MEEHANITE CAST IRON STEEL BRIDGES THE GAP

CIRCLE INFORM-A-GRAM KEY NO. 1323

This Progressive Die Makes 5,400 Ball Sockets an Hour



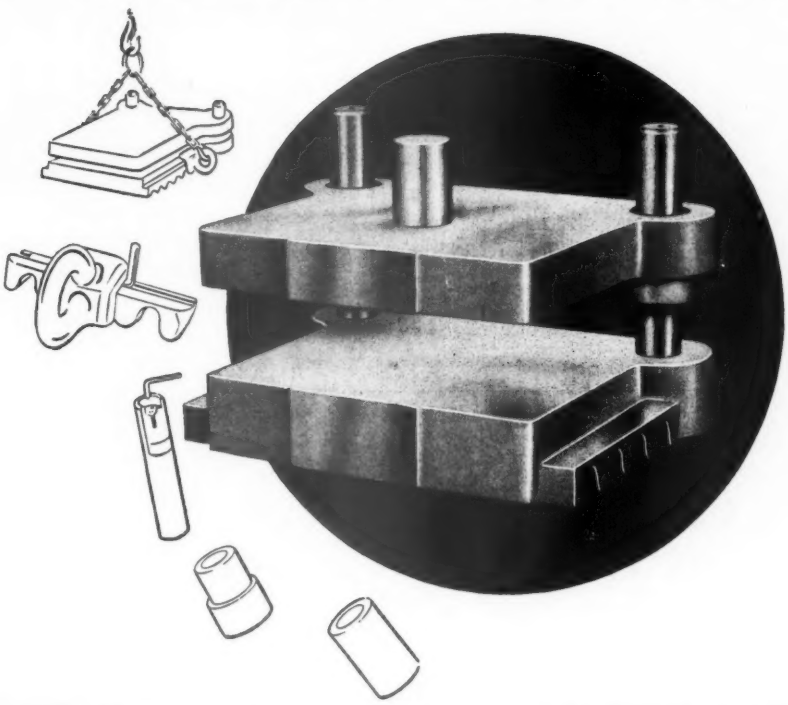
SEVERAL SHEET STEEL parts required by one manufacturer of home laundry equipment are used in such large quantities that very fast progressive dies are employed to meet volume demand and to effect production economies. The die illustrated here produces ball sockets at the rate of 5,400 an hour, using a press that makes 90 working strokes a minute. Thus, one completed stamping falls from the die at the end of each working stroke.

Stampings are made from mild ribbon steel ⅛" thick and 4" wide, advanced through the die by a standard "U. S." feed. At the first station a small circular hole is pierced and an I-shaped opening is punched which outlines the blank and nearly severs the blank from the skeleton ribbons formed along each side. The sides of the I-shaped opening are sinuous rather than straight because this shape results in substantially straight edges after the metal is gathered or drawn at the second station in forming the spherical socket. At the draw station, the ball-ended draw punch has a centered and pointed pilot pin that enters the small hole and insures proper positioning of the blank as it is drawn.

The ribbons at the edge of the skeleton travel in and are guided by slots in three spring-loaded pins along each side of the die. As the die opens, these pins are raised by their springs and lift the material out of the cavities in the die while acting as guides for the skeleton during its travel from station to station.

The third station is idle. At station four, two triangular punches on each side indent the stamping between its central hole and the flanges at each end. At the fifth station, a punch enlarges the central hole. The sixth station is idle. Finally, at the seventh station, the part is sheared from the skeleton and is ejected down through an opening in the die. Ribbons and skeleton remain intact at this station but are chopped at the end of the die and fall down a chute into a scrap can.

FAMOUS SUPERIOR DIE SETS NOW AVAILABLE FROM JERGENS



ONE STOP SERVICE FOR THE FOLLOWING TOOL ROOM NEEDS

ACME STANDARD BUSHINGS:
Drill Jig Bushings and Liners stocked in ASA & Acme Standard finished or with Grinding Stock; Liner pins and liner pin bushings; Leader pins and leader pin bushings.

FASTENERS & LOCATORS:
Socket Set Screws; Hex & Socket Head Cap Screws; Shoulder Screws; Flat Head Cap Screws; Pipe Plugs Regular & Dry Seal; Dowel & Taper Pins + .002 Dowels; Allenuts; Hex Head Nuts, Screws, Washers.

JERGENS STANDARD COMPONENTS:
Over 500 Standard parts including: Blank Jaws; Sine Fixture Keys; Clamp Shoe Assemblies; Thumb Screws; Jig Pest Buttons; Quarter Turn Screws; "C" Washers; Hand Wheels; Strap Clamps; Studs; Tee Set Kits, etc.

FEATURING REMOVABLE CAP GUIDE PINS

Enjoy the decided superiority of SUPERIOR DIE SETS and SUPPLIES including die springs, layout dies, lubricants, pins & bushings, bolster plates, etc., immediately available from Jergens. Superior Die Sets are available with easily removed cap guide pins that save time, effort, minimize danger of damage to costly dies.

Superior Die Sets and Accessories are distinguished for their long, accurate press runs—their precision manufacture of quality materials and for their exclusive safety features which safeguard against injury to handlers plus easier lifting and manipulating.

All these quality Superior features mean time, material and labor savings for you.

Write for complete specifications and price list.

Jergens BETTER TOOLS AT LOWER COST

TOOL SPECIALTY CO.

712 E. 163rd St. CLEVELAND 10, OHIO
KEnmore 1-2015

CIRCLE INFORM-A-GRAM KEY NO. 1324

DETECTOR SYSTEM FOR ELECTRICAL MAINTENANCE

A wired-in checking system, the Electro-Graphic Detector, is engineered to simplify the maintenance and servicing of complex electrical controls.

The various plant electrical control circuits are individually wired to corresponding schematic electrical diagrams on the test panel. The system is designed to eliminate long delays and tedious checking normally used to locate defects and failures in complex controls.

The wired-in electrical diagrams, placed between sheets of transparent plastic and mounted in separate illuminated panels, are equipped with terminal check points and sequence-indicating lights which enable the plant electrician to locate failures in the control system.

Each of the terminals represents a connection between two contacts in the electrical control.

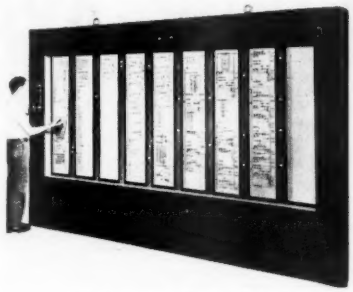


Photo courtesy W. F. & John Barnes Co.

A grounded test probe inserted in the terminal check points provides a means for determining the exact location of any defect in the electrical control circuit.

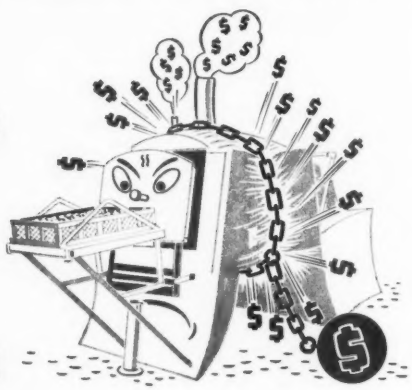
The series of lights located adjacent to the diagram indicate the progressive operation of the equipment through its entire cycle so that any stoppage or malfunction is readily apparent.

CALCULATE THE COSTS . . .

of Your Own

Heat Treating

Department



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THE Lakeside Steel Improvement Co.

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CIRCLE INFORM-A-GRAM KEY NO. 1325

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PUMP & FILTER DIVISION: Pumps, Filters, Electric Switches & Controls, Calibrating Tanks & Separators, Gauges, Thermometers, Compressors, Safety Tools, S.S. or Alloy Tanks & Vessels.

TELCO

TRUMAN E. LONGLEY CO.
4030 SUPERIOR AVENUE
CLEVELAND 3, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1326

Appointment of the Truman E. Longley Co., "Telco," of Cleveland as northern Ohio distributor for the entire Raybestos-Manhattan grinding wheel line is announced by Truman Longley, President of Telco. Raybestos-Manhattan specializes in rubber and resin bonded and diamond grinding wheels.

★ ★ ★ ★

Strong, Carlisle and Hammond Co. of Cleveland is now an authorized distributor for all products of the Boston Gear Works, Quincy, Mass. Boston Gear was founded 75 years ago, according to E. E. Stvan, Manager of the Industrial Supply department at Strong, Carlisle & Hammond, to manufacture high-quality, standardized gears at economical prices. Their products now include all types of gears, sprockets and chains, ratio-motors, reductors, Bost-bronze bearings, and pinions.

Use postage-free Inform-A-Gram Key Number Card for your request

"Automatic Temperature Control for Induction Heating Equipment" is a manual aimed at helping to clarify the role of automatic controls for this purpose. The theory of induction heating is touched upon in the booklet. Charts show the applications for types (according to the frequency used) of induction heaters and methods of controlling these types of equipment. Final sections in Bulletin HT-1 from Minneapolis Honeywell, Brown Instruments Div'n, Philadelphia, describe two Brown control systems for induction heating and melting.
Circle Inform-A-Gram No. C1.

Here's a Quick Reference Chart listing overall, flute, and assembled lengths of drills with utility or split sleeves, from Chicago-Latrobe. Printed in two colors on enamel finished stock, the 8-1/2" by 11-1/2" chart is punched for hanging on the wall. Get yours from Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill., or— **Inform-A-Gram No. C2.**

Electronic Controls are cutting costs of materials handling in almost every type of industry—from beverage bottling to metalworking and plastics. Forty-six of the numerous industrial applications of photoelectric controls, electronic timers, and electric counting equipment are described in a new booklet of case histories prepared and published by Photoswitch, Inc., Cambridge, Mass. Bulletin PG5360, "Cutting Production Costs," helps find ways your operations can profit by the use of electronic controls.
Circle Inform-A-Gram No. C3.

Engineering Cast Irons. Design Engineers especially will be interested in the "Guide to the Selection of Engineering Irons," Bulletin A69, from the International Nickel Co., Inc., New York 5, N. Y. The booklet presents basic reference material on the characteristics of modern nickel cast irons and illustrates their acceptance and use in industry. Useful tables, charts, and photomicrographs show how the engineering properties of cast iron can be controlled to meet service requirements through the use of nickel.
Circle Inform-A-Gram No. C4.

★ ★ ★

"MABLE GETS THE FACTS . . ."
Perhaps you have a "Mable" in your office or plant.

Mable, in this particular case, is an imaginary "My Friend Irma" character who's been hired as a stenographer at the Balas Collet Manufacturing Company in Cleveland, and "Mable Gets the Facts . . ." is an amusing yet highly informative booklet packed full of valuable facts on the subject of collets and feed fingers for screw machines. "What happened to Mable?" you ask. "How did we get on this subject?"

Well, in introducing Mable to the company and the products manufactured by the company, our steno's boss gives numerous time and money saving tips on the proper use and care of collets and feed fingers; notes on the elimination of unnecessary waste and correct operational instructions. Mable won't use all the information enumerated in the booklet because stenographers don't operate the machines, but anyone who works with screw machines, collets, feed fingers, collet pads, and feed finger pads — engineers, set-up men, operators, etc. — will find both information and entertainment in this booklet. Photos illustrate the factual material in the booklet and clever cartoons add emphasis to these facts.

Why don't you ". . . Get the Facts . . . about Balas Collets and Feed Fingers?"
Circle Inform-A-Gram No. C5.

★ ★ ★

"Die Casting — Molten Metal to Finished Part — Direct" discusses this production method as it affects product design, machining requirements, and surface finish. The basic steps of the die casting process are shown pictorially and concise descriptions of the dies and machines used are included in the 28-page illustrated booklet. Four sections cover zinc, aluminum, magnesium, and copper base die castings alloys and a chart in each section lists ASTM and SAE designations for each alloy, composition by weight, mechanical properties, and other properties and constants of each alloy. The booklet is available from the American Zinc Institute, Inc., 60 E. 42 St., New York 17, N. Y., or—
Circle Inform-A-Gram No. C6.

Precision Indexing demands careful designing and precision parts. Ferguson Machine & Tool Co.'s Catalog No. 105 gives valuable data and instructions for the calculation of loads, design of installations, and selection of drives for high speed precision indexing of automatic production machinery. Complete tables on load rating and dimensions of component parts and housed Ferguson Roller Gear drives are given in the booklet. Write to Ferguson Machine & Tool Co., Box 191, St. Louis 21, Mo., for your copy of this catalog.
Circle Inform-A-Gram No. C7.

"How Magnetic Testing Helps Maintain Your Quality Standards" is the title of an informative discussion of the subject published by The Indiana Steel Products Co., maker of permanent magnets. Magnetic tests, such as "open circuit," "pull-off," "pump handle," etc. are outlined in this discussion by Indiana Steel Products' Quality Control Manager Gerald T. Barta. Write to The Indiana Steel Products Co., Valparaiso Ind., for a copy.
Circle Inform-A-Gram No. C8.

"Handy Guide to Aid in Selecting and Operating Di-Acro Brakes" illustrates how a single Di-Acro Brake can be converted into a bar folder, tab former, radius former, open end brake, standard brake, or box and pan brake, by simply changing the

top forming bar. This manual by O'Neil-Irwin Manufacturing Co., 626 Eighth Ave., Lake City, Minn., contains specifications and capacities on all Di-Acro Brakes in table form for easy reference. More than 35 photos and diagrams illustrate the booklet.
Circle Inform-A-Gram No. C9.

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Taps, Dies Counterbores, and keyway broaches are plotted in graphic form against the range of product sizes in the industrial consumer price lists published by Threadwell Tap & Die Co. Every tap, die, etc., is pictured and described as to type, steel, shank, cutting size, and catalog number. The lists are available from Threadwell Tap & Die Co., Greenfield, Mass., or— **Circle No. B1.**

"How to Cut Die and Mold Finishing Time 50% to 94%" is a 4-page folder showing the application of American Wheelabrator & Equipment's "Liquamatte" machines for cleaning dies and molds. Illustrated cases with actual performance data are given. American Wheelabrator & Equipment Corp., 1183 S. Byrkit St., Mishawaka, Ind.
Circle Inform-A-Gram No. B2.

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the leading builder of precision spindles

REPAIRS SPINDLES TOO

BELT DRIVEN — MOTORIZED — HIGH CYCLE

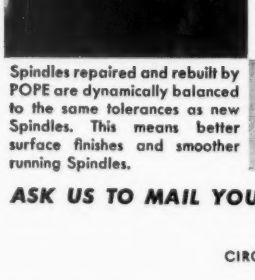
ANY SIZE — ANY MAKE

OF ANTI-FRICTION BEARING SPINDLE THAT IS REPAIRABLE

For precision grinding, milling or boring, Spindles must be in first class running condition to produce good work and more of it.

The place to have your Spindles built to their original performance is where Precision Spindles are built.

You can send your Spindles to us with CONFIDENCE, knowing the job will be done right the first time and at the lowest possible cost. Cost figures are submitted for your approval before we proceed with the work.



Spindles repaired and rebuilt by POPE are dynamically balanced to the same tolerances as new Spindles. This means better surface finishes and smoother running Spindles.

FOR FAST SERVICE, THE RIGHT BEARINGS, BETTER WORKMANSHIP AND LUBRICATION, AT LOWER COST

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POPE MACHINERY CORPORATION

Established 1920

261 River St. • Haverhill, Massachusetts

ASK US TO MAIL YOU A COPY OF SPINDLE REPAIR BULLETIN R-1

CIRCLE INFORM-A-GRAM KEY NO. 1341

Torque Limiting Wrenches. A colorful and informative 20-page catalog of precision torque limiting wrenches and accessories is offered by Jo-Line Tools, Inc. The booklet describes 13 torque wrench models, devotes a section to sockets, adapters, and accessories, and contains a comprehensive appendix of engineering information pertaining to torque control. Jo-Line Tools, Inc., 8442 Otis St., South Gate, Calif.
Circle Inform-A-Gram No. B3.

Explosion-Proof Valves. Eight-page Bulletin AV300R shows installation photos and describes in detail all parts and functions of the "packaged" Bellows Electroaire Valve air control unit. Schematic drawings and details covering the explosion-proof valve. The Bellows Co., 222 W. Market St., Akron, Ohio.
Circle Inform-A-Gram No. B4.

Screw Thread Gaging. The O-Vee Gauge Co., 2516 W. Vernon Ave., Los Angeles 8, Calif., has made available reprints of an article, "A Simplified Approach to Gaging of Screw Threads," which appeared in the January, 1954 issue of TOOLING & PRODUCTION.
Circle Inform-A-Gram No. B5.

Shock and Vibration Insolators. An 8-page brochure, Product Bulletin No. 541, describes the features and uses of the Barry Corp.'s type 5200 shock and high vibration insolators. Graphs in the brochure give data for isolator loads, shock and vibration transmissibility, and coupled natural frequencies. Get your copy from Barry Corp., 1000 Pleasant St., Watertown, Mass.
Circle Inform-A-Gram No. B6.

Worm Gearing and worm gear speed reducers are fully described and illustrated in the extensive 173-page Catalog No. 400, published by The Cleveland Worm & Gear Co., 3249 E. 80 St., Cleveland 4, Ohio. All vital details, plus interesting notes on the actual application of Cleveland units are given.
Circle Inform-A-Gram No. B7.

"Deep Drawing Hydraulic Presses for Metal Working" is an introduction of M & N Hydraulic Press Co.'s new line of presses. This informative booklet offers a complete description of the features incorporated in the new presses and emphasizes the advantages from hydraulically controlled operations. Ask for Bulletin 502-A, M & N Hydraulic Press Co., 780 Route 3, Clifton, N. J.
Circle Inform-A-Gram No. B8.

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

The Emco Power Punch Press is featured in a booklet published by The Klass Machine & Manufacturing Co., 4314 E. 49 St., Cleveland 25, Ohio. Emco "X" has a normal speed of 2½ strokes per second and the Emco "W" has a speed of 5 strokes per second.
Circle Inform-A-Gram No. B9.

Engraver. A brochure from the Green Instrument Co., 386 Putnam Ave., Cambridge, Mass., describes in detail the Green Model D-2 Heavy Duty Pantograph Engraver. The booklet illustrates the machine's design which enables it to mill, profile, and engrave large panels and bulky workpieces.
Circle Inform-A-Gram No. B10.

Transfer Machine. Typical specifications for the Ferguson Machine and Tool Co.'s "Trans-o-Mator," a straight line multiple station transfer machine which the user tools for his own use in light machining, forming, pressing, assembly, and inspection operations, are listed in the company's new bulletin. Get your copy from Ferguson Machine & Tool Co., Inc., Roller Gear Div'n, Box 191, St. Louis 21, Mo.
Circle Inform-A-Gram No. B11.

Presses. The Federal Press Co.'s 18-page catalog of open-back, inclinable presses features an illustrated production story on the use of dial feeds. Photographs and line drawings throughout the catalog demonstrate the press mechanisms. Get your copy from The Federal Press Co., Elkhart, Indiana.
Circle Inform-A-Gram No. B12.

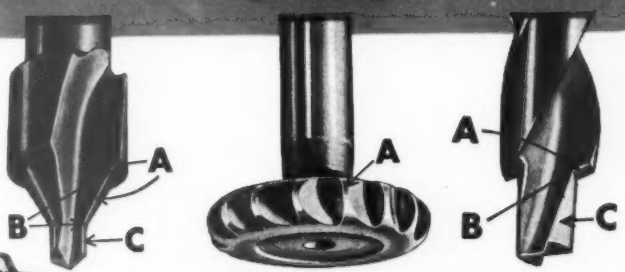
"Precision," latest catalog by Swiss American Jewel Bearings, accurately delineates the specifications of the company's jewel bearings, indicates available tolerances, and presents a hardness comparison chart. Swiss American Jewel Bearings Co., 32-30 58 St., Woodside 2, Long Island, N. Y.
Circle Inform-A-Gram No. B13.

"How to Case-Harden Tools" introduces "Royal" Hardening Powder, claimed to provide a simplified method for quick-surface hardening of steel tools, dies, parts, and cutting implements. Developed to replace cyanide, eliminating poisonous fumes, the compound is applied to areas heated to 1400°-1700° with heat maintained 15 to 30 min., then quenched for desired temper. A folder and sample of "Royal" Hardening Powder are available from the manufacturer, Anti-Borax Compound Co., 1506 Wall St., Fort Wayne, Ind.
Circle Inform-A-Gram No. B14.

Pump Users should be interested in the circulating and coolant pump bulletin recently published by Ingersoll-Rand Co. This new bulletin, Form 7074-D, shows the entire line of Class KRV and KRVS "Motorpumps." A pictorial index helps select the correct pump for any purpose. Write to Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Circle Inform-A-Gram No. B15.

"Ejector Pin Data" is available from Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich. Information on hone finished threaded ejector pins, core pins, sprue puller pins, and an ejector pin table of decimal equivalents are included in the bulletin. Line drawings show typical applications for the various pins.
Circle Inform-A-Gram No. B16.

"RO" Form Relief means longer life for cutting tools because it leaves supporting metal behind the cutting edge



A Sharpens these cutting edges with any degree of form relief.
B No undercutting at intersection — no burr on work piece.
C Diameters can be cylindrically ground or relieved as desired.

There is a constant increase in the number of shops bringing their tool grinding practices up to date by standardizing on form relief sharpening as a means of reducing tool costs. No other fixture offers the ease of set-up and operation and the flexibility of the "RO" Universal Form Relieving Fixture.

WRITE FOR CATALOG

GRINDER DIVISION
ROYAL OAK TOOL & MACHINE CO.
29600 STEPHENSON HY.
ROYAL OAK, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1351

Square Type Hydraulic Cylinders are the subject of colorful Bulletin 113-A available from Hannifin Corp., Des Plaines, Ill. All vital information on the Hannifin Series "H" square type cylinders is presented with the aid of line drawings and size charts.
Circle Inform-A-Gram No. B17.

Model D Aeroturn Dust Collector is your solution if you have a dust problem **and** a space problem. A folder from Turner & Haws Engineering Co., Inc., 87 Gardner St., W. Roxbury 32, Mass., describes the new Model D units.
Circle Inform-A-Gram No. B18.

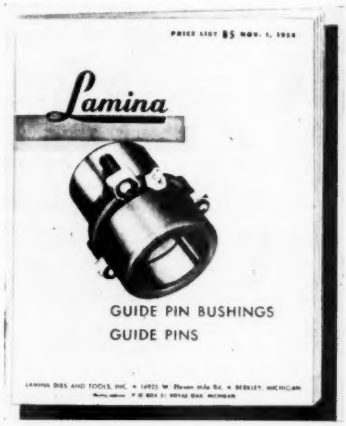
Sunoco "Way Lubricant," a special non-corrosive lubricant for the ways of machine tools, is described in a new Sunoco Technical Bulletin. Write to Sun Oil Co., Philadelphia 3, Pa., for your copy.
Circle Inform-A-Gram No. B19.

Couplings. Hansen Series 3-RL quick-connective ring-lock couplings for pneumatic service applications are illustrated with photos, drawings, and complete specifications in a new catalog page. Get your copy from The Hansen Mfg. Co., 4031 W. 150 St., Cleveland 11, Ohio.
Circle Inform-A-Gram No. B20.

END MILL SPECIALISTS
and What it...
...Means to YOU...
HIGH SPEED
TWO FLUTE
THREE FLUTE
FOUR FLUTE
LONG LIFE
The major portion of production at Melin Tool Company is devoted to End Mills. When you specify MELIN...you know your order is receiving personal attention. There are no priorities in other divisions.
Write for the new Melin Tool Catalog and Price Sheet.
MELIN TOOL CO. INC.
Representatives in Principal Cities
MELIN TOOL COMPANY, INC.
3371 West 140th St., Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1361

Guide Pin Bushings and guide pins are featured in a new 12-page catalog by Lamina Dies and Tools, Inc. Photos and detailed line drawings



help make this a helpful reference piece. Get your copy from Lamina Dies and Tools, Inc., Box 31, Royal Oak, Mich.
Circle Inform-A-Gram No. B21.

Grinder Information. What the Landis 4" Type H Plain Grinder is and how it works is illustrated with 37 photographs and sketches in the 16-page Catalog A-54 of the Landis Tool Co., Waynesboro, Pa. Arranged for quick study of the grinder, this catalog should prove a valuable bulletin for all metalworking production men and engineers.
Circle Inform-A-Gram No. B22.

"V40 for Tool Room Grinding" describes a complete, new line of tool room wheels and lists hints for the conservation of tools. Included in the brochure is a separate, handy tool room chart which gives recommendations for grinding high speed tool and die steels. Get your copy from The Carborundum Co., Niagara Falls, N. Y.
Circle Inform-A-Gram No. B23.

The "Tuff-Tite" multi-purpose fastener with a one-piece metal head and pre-assembled neoprene washer is featured in a brochure now available from the Townsend Co., New Brighton, Pa. Brochure TL 97 explains how Tuff-Tite's design and components prevent leaks, protect surfaces, absorb shocks, and stop squeaks.
Circle Inform-A-Gram No. B24.

Drilling — Operations and Maintenance of the new Dumore automatic drill unit, Series 24, are described in the company's 16-page illustrated "Operations and Service Manual." A 2-page reference chart supplies extra information to facilitate rapid maintenance. Copies of the booklet are available from Dept. 24, Dumore Precision Tools, 1300 Seventeenth St., Racine, Wis., or—
Circle Inform-A-Gram No. B25.

Cast Iron Laps are now being manufactured for use with Superior honing equipment. The new laps are shell molded, mounted and ground to the customer's specifications. They range in size from 3/16" to 1". Literature on these laps is available from Superior Hone Corp., 1619 Elreno St., Elkhart, Ind.
Circle Inform-A-Gram No. B26.

Hardness Tester. The characteristics and uses of the new Kentrall Hardness Tester have been published in a 4-page bulletin by the Torsion Balance Co., Clifton, N. J. Illustrated features are the Kentrall Dial Gage and Load Selector, and the Kendent X Indenter. The instrument performs tests in both the superficial and regular ranges of Rockwell hardness.
Circle Inform-A-Gram No. B27.

Floor Type Horizontal Boring, drilling, and milling machines are described in Bulletin 954, Cincinnati Gilbert Machine Tool Co., Cincinnati 23, Ohio. The 14-page bulletin contains specifications, photographs of the equipment in use, and design details.
Circle Inform-A-Gram No. B28.

The Kodagraph Microprint Reader is illustrated in a folder published by Eastman Kodak Co. The full-color brochure points out that the device is designed to be used in offices and libraries where literature and reference books have been reduced to microprint cards. The full color folder, "Kodagraph Microprint Reader, Model A," may be obtained from Industrial Sales Div'n, Eastman Kodak Co., Rochester 4, N. Y., or—
Circle Inform-A-Gram No. B29.

Air Gage Reconditioning is a new service undertaken by Freeland Gauge Co., 9940 Freeland Ave., Detroit 27. The Freeland staff has developed methods for the restoration of members and masters for all air gaging circuits; flow, back pressure, or differential. A booklet published by this gage company describes the reconditioning service.
Circle Inform-A-Gram No. B30.

The Facilities of the Biddle plant, devoted to the production of screw machine products, are illustrated and described in a new 8-page brochure offered by Biddle Screw Products Co., Dept. B-299, Sheridan, Ind.
Circle Inform-A-Gram No. B31.

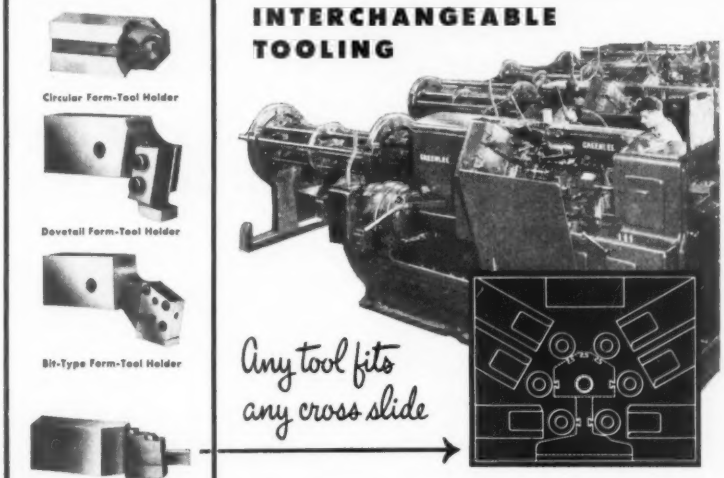
"Maintenance is Big Business," says Anderson-Nichols & Co., in the brochure describing the company's program for maintenance improvement. The booklet, "Get Better Maintenance," is now available from Anderson-Nichols, 150 Causeway St., Boston 14, Mass.
Circle Inform-A-Gram No. B32.

Bellows Air Motors and Valves are completely illustrated and described in Bulletin SP-50 of The Bellows Co., 222 W. Market St., Akron, Ohio. This 28-page "Spec Book" includes 75 illustrations and 27 specifications charts.
Circle Inform-A-Gram No. B33.

Presses. A new catalog — the first to be issued by the company — has just been completed, describing the new line of Steelweld Two-Point Presses recently introduced by the Cleveland Crane & Engineering Co., Wickliffe. Ask for No. 2018, or—
Circle Inform-A-Gram No. B34.

GREENLEE Automatics

INTERCHANGEABLE TOOLING



Circular Form-Tool Holder
Dovetail Form-Tool Holder
Bit-Type Form-Tool Holder
Cut-Off Tool Holder
Knurling Tool Holder
Stencilling Wheel Holder

Any tool fits any cross slide

SAVE TIME AND MONEY
REDUCE JOB COSTS

Among the cost-saving features of Greenlee Automatics, one of the most advantageous is the arrangement whereby *any* of various standardized tool holders will fit in *any* of the six cross-slides. This means not only no limitations as to what tools can be used in which positions, but also a minimum requirement for investment in tools, and a maximum of speed in tool setting when changing over between jobs. *You can profit* from this and the many other outstanding features of Greenlee Automatics.

Write for FREE Literature

Send today for your copy of our 20-page booklet describing and illustrating all the Greenlee features.

GREENLEE

GREENLEE BROS. & CO.
2041 MASON AVE., ROCKFORD, ILL.

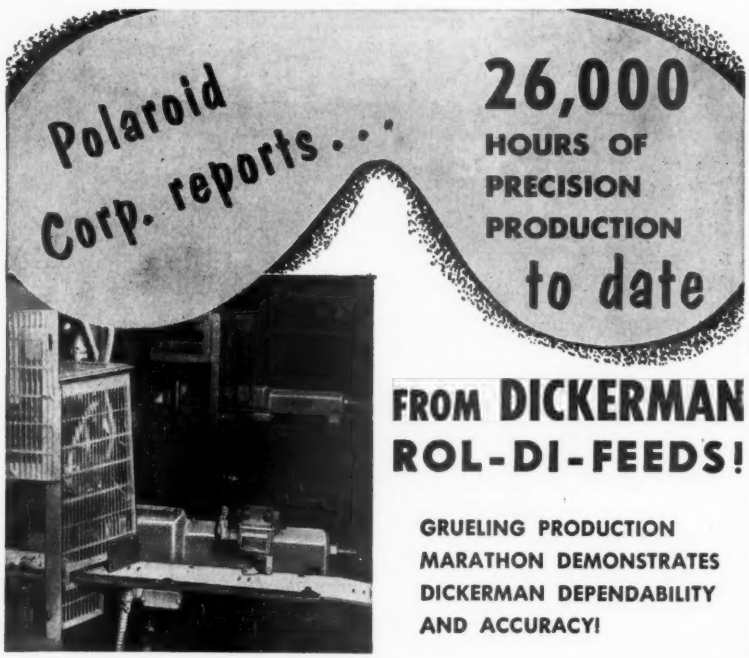
CIRCLE INFORM-A-GRAM KEY NO. 1371

Packaged Arbor Spacers and shims (packed 10 to an envelope) are the subject of Catalog 325, Precision Steel Warehouse, Inc., Mfg. Div'n, 4401 W. Kinzie St., Chicago 24, Ill. Sizes vary from ⅜" hole diameter and 0.001" thickness to 7" diameter and 0.125" thickness.
Circle Inform-A-Gram No. B35.

The Story of Airswitch air valves is told in a catalog circular now available from Airelectric Corp., Box 208, Melrose Park, Ill. These valves are designed for automation, they will operate to 50', and are non-electrical.
Circle Inform-A-Gram No. B36.

Magnus Polishing Units for small burring and polishing operations are the subject of a folder from F. W. Derbyshire, Inc., Waltham, Mass. The small units — take only 8" by 12" bench space — have spindle speeds to 18,000 rpm.
Circle Inform-A-Gram No. B37.

Standard Gear Hob Tolerances are listed in the illustrated reference manual (SC-1) from Star Cutter Co., 34500 Grand River Ave., Farmington, Mich. Two pages of the catalog are devoted to a discussion of the accurate unground form class of hobs.
Circle Inform-A-Gram No. B38.



FROM DICKERMAN ROL-DI-FEEDS!

GRUELING PRODUCTION MARATHON DEMONSTRATES DICKERMAN DEPENDABILITY AND ACCURACY!

3 years of unfailing service — 24 hours per day — with no overhaul or appreciable maintenance — is the phenomenal record established by Dickerman Rol-Di-Feeds in the Sun Shield Department of the Polaroid Corp. More than 70,200,000 pieces have been produced . . . the original feeds are still in daily operation and . . . are expected to outlast the die itself.

Feeding .030" polarizing lens stock at 30-60 strokes per minute (depending on requirements) the Rol-Di-Feed activates optically perfect material that must be fed and blanked to micro-tolerances without the slightest trace of scratching or marring.

Dickerman

H. E. DICKERMAN MFG. CO.
324-247 ALBANY ST. • SPRINGFIELD, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 1381

Universal Expanding Mandrels by Le Count are covered in a 4-page folder. Both the Type "A" Count-Centric Expanding Mandrel, with guaranteed concentricity within 0.0005" total indicator reading, and the new Type "S", with guaranteed concentricity within 0.0002", are fully described. Le Count Tool Works, Inc., 390 Capitol Ave., Hartford, Conn.
Circle Inform-A-Gram No. B39.

Cutting Blades. Many of the Union cutting blades described in Catalog SI fit a number of cutters. They can be inserted quickly when necessary and are made in high speed steel or super high speed steel, or are carbide tipped. Catalog SI is from Union Twist Drill Co., Athol, Mass.
Circle Inform-A-Gram No. B40.

Work Light. The "Lite-Mite Twin 8-Watt" fluorescent work light by Stocker & Yale is sturdy and adjustable, and is constructed to eliminate glare and shadows on factory bench, machines, desks, drawing boards, etc. An illustrated brochure giving specifications and prices of this light is available from Stocker & Yale, Inc., 153 Green St., Marblehead, Mass.
Circle Inform-A-Gram No. B41.

"Stair Cart" is a new stair climbing hand truck and the title of a booklet describing the cart. A special ratchet mechanism on the "Stair Cart" enables it to roll up stairs step by step as the operator pulls a cable drive. Get your copy of the booklet from Valley Craft Products, Inc., Div'n of O'Neil-Irwin Mfg. Co., 750 Jefferson Ave., Lake City, Minn.
Circle Inform-A-Gram No. B42.

Temperature Cabinets. A new 4-page bulletin features three types of Trop-Arctic temperature cabinets for cold and heat requirements with temperature ranges from −200°F. to +300°F. Trop-Arctic Temperature Products, Dept. B-299, 627 S. Mulberry St., Muncie, Ind.
Circle Inform-A-Gram No. B43.

Formsprag's New 20-Page Catalog is now available. The company manufactures over-running clutches for over-running, backstopping, and indexing applications. Sections of the

catalog give information on selection, installation, and maintenance, and the special design service offered by the Formsprag Co., 23601 Hoover Rd., Van Dyke, Mich.
Circle Inform-A-Gram No. B44.

Despatch Engineered Spray Booths — water wash and dry types — are pictured and described in Despatch Oven Co.'s Bulletin No. 66. Address your paint spray booth bulletin request to Despatch, 619 Eighth St., Minneapolis, Minn.
Circle Inform-A-Gram No. B45.

"The JAco Ebert Plane Grating Spectrograph with Order Sorter" illustrates and describes the first spectrograph that is adapted to all spectra, from the simplest to the most complex. Ask for Catalog EC-10-54, Jarrell-Ash Co., 26 Farwell St., Newtonville, Mass.
Circle Inform-A-Gram No. B46.

Tray-Top Lathes. The attractive new Cincinnati Lathe & Tool Co. Catalog Section T-117 gives all the vital specifications and features of two new Cincinnati lathes, the light-duty 21½" and 26" Tray-Top engine lathes. Write to Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio.
Circle Inform-A-Gram No. B47.

"Precision Machining of Aircraft and Automotive Parts" is a 4-page introduction to Crescent Manufacturing Co., its manufacturing equipment, facilities, and products. Write to Crescent Mfg. Co., Box 29, Allegan, Mich.
Circle Inform-A-Gram No. B48.

"Compact" Hydraulic Cylinders are described in 8-page Catalog 54-68, available from Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich. Cutaway photographs and installations drawings illustrate design features of this general-application industrial cylinder. **Circle No. B49.**

Cam Clutches. A comprehensive reference file describing the complete line of Morse Cam Clutches for indexing, overrunning, and backstop applications is now available from Morse Chain Co., 7601 Central Ave., Detroit 10.
Circle Inform-A-Gram No. B50.

Profile Grinders. Union Twist Drill has published two booklets on the company's No. 3 and No. 5 tangent-arc profile grinders. The well illustrated folders present complete information on these units. Write to Union Twist Drill Co., Athol, Mass, or—**Circle Inform-A-Gram No. B51.**

Compressor Users should be interested in the new PHE air compressors and vacuum pumps by Ingersoll-Rand. A new brochure from I-R depicts these opposed-cylinder, heavy duty, compact, 75 and 100 hp units. Ingersoll-Rand, 11 Broadway, New York 4, N. Y. **Circle No. B52.**

Production Tools listed in Commander Mfg. Co.'s Catalog No. 954-1 include tappers and drill chip breakers, the "Multi-Angle" drill unit, adjustable "Multi-Drill," and drilling coolant table. Get your copy from Commander, 4225 W. Kinzie St., Chicago 24. **Inform-A-Gram No. B53.**

Only 3P saves for all three...

which man are you?

MANUFACTURER
A Punch Inventory is a frozen asset. PORTER will produce your punches to your prints—or—with a small change in your design—the 3P catalog will save you thousands of dollars.

JOB STAMPER
PORTER Punches and Die Buttons take the guess work out of estimating. PORTER offers IMMEDIATE DELIVERY of punches and die-buttons at less cost than when you make them yourself!

DIE MAKER
PORTER'S volume production—quality control—immediate delivery—all lower costs and improve performance. Money saved is your advantage. Custom Punches and Dies are costly and a headache.

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24 HOUR DELIVERY!
LOWER COST TO BUY—LOWER COST TO USE!
1. Cut your Inventory
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Porter Punches in stock in all principal cities. Send for complete catalog and prices.
CIRCLE INFORM-A-GRAM KEY NO. 1391

HUPP GIVES YOU

POWER TILT

for

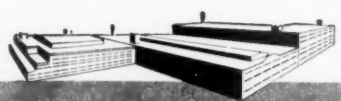
safety • economy • convenience

Fingertip tilting brings you the advantages of faster tumbling cycles, reduced operator fatigue and savings of floor space in your finishing department. Globe's new tilting mechanism enables your operator to quickly move the barrel to pre-selected or manually selected operating position by means of a simple, 3-position reversing control.

Write for Tumbling Barrel Bulletin B-9

WHAT'S YOUR FINISHING PROBLEM?

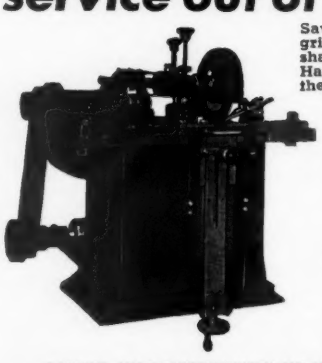
Let HUPP's experimental engineering service analyze your parts finish needs. Send samples of parts and completed piece to show desired finish. HUPP will provide detailed cost-saving finishing recommendations. Write today! No obligation, of course.



HUPP CORPORATION
GLOBE STAMPING DIVISION
1250 WEST 76th STREET • CLEVELAND 2, OHIO
SERVING INDUSTRY SINCE 1902

CIRCLE INFORM-A-GRAM KEY NO. 1401

Get three or four times More service out of hack saw blades



Savings in blade purchases alone can pay for this grinder the very first year. Instead of one or two sharpenings per blade the EC Combination Circular, Hack and Band Saw Grinder enables you to sharpen them five or six times before discarding.

The EC is a precision sharpener, the only grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. This unique feature enables operator to grind a variety of blades without dressing or changing wheels. Write for Bulletin.

WARDWELL MANUFACTURING CO.

3809 Ridge Rd. Cleveland 9, Ohio

MAKER OF LARGEST LINE OF SAW AND TOOL SHARPENING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 1402

"Intricate, Small Zinc Die Castings" shows how the Page & Hall Manufacturing Co., Inc., 1249 Farmington Ave., W. Hartford 7, Conn., produces small quantities of die castings economically. A handy zinc die casting designs guide points out design factors that influence economical die casting.
Circle Inform-A-Gram No. B54.

Micro Drill Guides. An easy reference circular on this subject has been published by Micro Drill Guide Div'n, Jessup Engineering & Development Co., 3980 Superior Ave., Cincinnati 36, Ohio. A complete chart on hole sizes, body sizes, and lengths of micro drill guides is presented.
Circle Inform-A-Gram No. B55.

Four Manufacturing Processes previously largely restricted to military goods manufacture are revealed in detail by the A. O. Smith Co., Milwaukee 1, Wis., in a 26-page brochure which describes and offers the company's talents and facilities in metalworking.
Circle Inform-A-Gram No. B56.

Hardness Testing. Gries Bulletin No. A-12 describes the company's new hardness tester that can perform 400 precision tests per hour, has a "read-on-sight" dial built in, and an automatic zero setting. Gries Industries, Inc., Testing Machine Div'n, Beechwood Ave. at Second St., New Rochelle 6, N. Y.
Circle Inform-A-Gram No. B57.

Flat Ground Die Steel in the Simonds Saw and Steel Co. line is listed in a pocket-size booklet available from Simonds. All "1001 sizes for 1001 uses" together with prices, weights, analysis, heat treatment, etc. is covered in the booklet. Write to Simonds, Dept. L, Fitchburg, Mass.
Circle Inform-A-Gram No. B58.

Shell Threader. A new 4-page bulletin published by the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., describes the company's automatic, inclined, shell thread rolling machine. Bulletin 833-El-2 discussed the use, construction, operation, drive, and tooling of the machine, and gives a complete table of specifications for two different sizes.
Circle Inform-A-Gram No. B59.

The New "Toolmaster" Milling Machines by Cincinnati Milling Machine Co., Cincinnati 9, Ohio, are built in three styles, with manual feed to quill, power feed to quill, and heavy duty head. All three styles are illustrated and described in the new catalog, No. M-1870. Numerous Toolmaster exclusives for rugged construction, operating convenience, and long life are featured.
Circle Inform-A-Gram No. B60.

The Northern Ohio Sales Representative for The Cleveland Metal Abrasive Company is **Robert S. Minning,** according to a recent announcement from the firm.

◆

Lyman K. Shepard is now Sales Manager of the Wisconsin Drill Head Company. This appointment, according to Henry Schulz, President of the company, marks the first step in an expansion program by Wisconsin Drill Head and its associate, Northwest Tool and Engineering Company.

◆

William T. Clark is the new Wisconsin agent for the Morton Bearing Co., of Ann Arbor, Mich.

◆

Ben A. Fleury has been appointed Chicago District Manager for the Union Twist Drill Company. Mr. Fleury was formerly Vice President of Charles Products Company, Chicago.

◆

Furane Plastics, Inc., announces the appointment of **H. B. Effefson,** of Fort Worth, as Central and Southwest Representative for the company in the sale of "Epocast" resins and formulation.

◆

T. J. Bromeling was recently named Manager of Industrial Sales by The Colson Corporation, Elyria, Ohio, manufacturer of wheeled products for industry and institutions.

◆

The appointment of **Herb Ainsworth** as District Sales Manager, Detroit office, was announced recently by Dumore Precision Tools, Racine, Wis. Mr. Ainsworth was formerly the Dumore St. Louis District Manager.

◆

Size Control Company, Chicago gage and lapping machine manufacturer, anounces the appointment of **Bill Wepfer** as representative for Arkansas, Mississippi, and the southern half of Louisiana.

The appointment of **Lester G. Weidler,** Tool Engineer, to the sales engineering staff of the Indianapolis district is announced by Wesson Co., Detroit manufacturer of carbide cutting tools.

◆

The newest carbide metal producer in the country, Firth-Loach Metals, Inc., McKeesport, Pa., has announced the appointment of **Louis De Marco** as Vice President in charge of Sales and Engineering, and of **James E. Gray** as Sales Manager.

The metropolitan New York City and northern New Jersey area will be covered for Hy-Pro Tool Co. by **John M. Horvath,** recently appointed Direct Factory Representative for the company.

◆

Carl J. Ricker succeeds Guy Prettyman, who has retired as Chief Sales Engineer of E. W. Bliss Company's Hastings Division. Mr. Ricker has been associated with Bliss for the past 20 years as head of parts sales and engineering at the Hastings plant.

5403

do you
WASTE MONEY
RISK ACCIDENT
doing things the
HARD WAY?

Take a trip through your plant today and note how many assembly and maintenance operations are being done in awkward or tiresome positions.

Imagine
THEM BEING DONE ON
PORTELVATOR
THE HANDY HAMILTON PORTABLE ELEVATING TABLE

With Portelvator hundreds of assembly and maintenance jobs are accomplished at the *right height* and in the *best light*. And that means money in the bank and workmen on the job, faster work and fewer accidents.

Portelvator prices start at $155.00—place a couple at your workmen's disposal and watch results.

Complete description in FREE Bulletin No. P-5403.

WRITE FOR IT!
Address The Hamilton Tool Company,
832 South Ninth Street, Hamilton, Ohio

IT'S A *Hamilton Tool*
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1411

- *New Equipment*
- *New Materials*
- *New Literature*

WHAT'S NEW

Several Trial Formulations and properties of cold casting compounds based on "Thiokol" liquid polymer LP-2 are described briefly in a 4-page bulletin issued by the Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton, N. J. The compounds are oil and solvent resistant and are currently being used for potting electrical components and for flexible molds and patterns.
Circle Inform-A-Gram No. E1.

Powdered Nylon Additives have been found to improve the abrasion resistance and extend the service life of plastic drawing dies and tooling. In addition, powdered nylon such as "Nylasint" acts as a suspending agent to other metallic fillers which are often necessary to prevent exotherms. National Polymer Products, Inc., Reading, Pa., will supply further information.
Circle Inform-A-Gram No. E2.

Choose INDEX MILLS

Model 55 Vertical Mill

The Improved Low-Cost Machines that give you

GREATER VERSATILITY!
GREATER ECONOMY!
EXTRA CAPACITY!

You get more when you buy an Index Mill —more quality, superior features. You are not just buying a machine . . . You are investing in equipment that will deliver better results at lower cost. The ideal machines for all your

MILLING, BORING and DRILLING JOBS

Outstanding in this great line is this versatile MODEL 55 VERTICAL MILL, designed for those extra capacity jobs often found in tool and die shops; provides increased speed and feed range. Capacity ⅛" to 1½" end mills in steel, a table working surface of 32" x 9" or 38" x 9"; overall 40" x 9" or 46" x 9".

MODEL 40 VERTICAL MILL
For speedy, economical milling. Spindle gives 9 speeds, 125 RPM to 2250 RPM. Easy to operate. Rugged, for every day operation; also used for boring and locating. Capacity ⅛" to 1" end mills in tool steel. Table working surface 8" x 26", 8" x 34" overall.

MODEL 60 HORIZONTAL MILL
Simple, efficient, compact, with all operating parts enclosed, yet readily accessible. Unusually low-priced. Designed for the average tool room, yet highly suitable for production shops through its rigidity and low maintenance cost. Standard table 40" x 9", larger table optional.

INDEX BUILDS BETTER MILLS . . . WRITE FOR LITERATURE

INDEX MACHINE CO.

541 N. MECHANIC STREET JACKSON, MICHIGAN

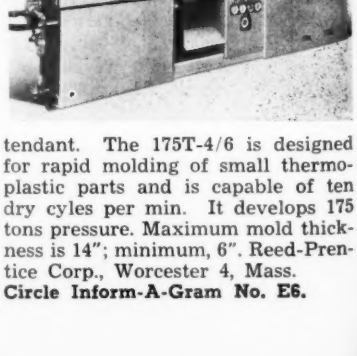
CIRCLE INFORM-A-GRAM KEY NO. 1421

Application of PrEpoxy Partingkote 832-A to the molds prevents Epoxy tools from sticking to the molds. This new compound is a film-forming low-shrink plastic solution with a black color which minimizes the possibility of misses on thin areas in the applied parting film. It is a ready-to-use material which may be sprayed or brushed onto the mold. PrEpoxy Partingkote is correct for any room-temperature curing Epoxy. Rezolin, Inc., 5736 W. 96 St., Los Angeles, Calif. **Circle No. E3.**

VacForm Mobile Pump Wagon lends itself to many applications including vacuum and drape forming of rigid plastics and bag molding. To use, the operator pushes the unit to the point of installation, connects the heavy-duty hose to the equipment to be used, and plugs the electrical connection into a socket. Vacuum Forming Corp., 76 Bayles Ave., Port Washington, N. Y. **Circle No. E4.**

"Epocast" Patching Compound H-783-A repairs plastic structures rapidly. Containing aluminum powder, it is metallic in appearance. As a paste it is non-flowing and easily spread. The paste sets up rapidly (in 15 to 30 min.) after hardener is added. This compound is available in 4 oz, 5 gal or 50 gal sizes from Furane Plastics Inc., 4516 Brazil St., Los Angeles 39. **Circle No. E5.**

Low Pressure Die Closing attachment assures positive mold protection in full automatic operation on the new Reed-Prentice 175T-4/6 oz plastic injection molding machine. With this attachment installed on each machine it is possible to operate a battery of these "Reeds" on full automatic cycles with only one attendant. The 175T-4/6 is designed for rapid molding of small thermoplastic parts and is capable of ten dry cyles per min. It develops 175 tons pressure. Maximum mold thickness is 14"; minimum, 6". Reed-Prentice Corp., Worcester 4, Mass.
Circle Inform-A-Gram No. E6.



IN PLASTICS?

- *Plastics Fabrication*
- *Plastic Tooling*
- *Plastics Molding*

Vin-Rock Super XX mold release liquid is suitable for both injection and compression molding. It dries almost instantly to a hard, smooth, glossy finish that destroys the affinity of the plastic for the mold, and

will not discolor even the lightest plastics. Bulletin 497 describes Super XX. Pictured is a sample product molded with Vin-Rock Super XX mold release. Vin-Rock, Inc., 8211 Almira Ave., Cleveland 2, Ohio.
Circle Inform-A-Gram No. E7.

"Molded Plastics in Small Lots" gives a picture of Dayton Rogers' short-run plastics manufacturing facilities. Examples of short run molding costs are graphically shown with drawings and price quotations illustrating actual applications. Molds are made, stored, and maintained by D.R. so they are immediately available for reruns. Dayton Rogers Manufacturing Co., Minneapolis, Minn.
Circle Inform-A-Gram No. E8.

Epoxy Resin Adhesives are discussed in the latest 16-page technical data brochure being distributed by Armstrong Products Co., Dept. TD, Warsaw, Ind. The brochure also contains information on a new line of low shrinkage epoxy resin formulations.
Circle Inform-A-Gram No. E9.

A Hydraulic Plastics testing machine primarily designed to test the flow characteristics of thermosetting plastics material by using the ASTM standard cup mold method is available from The Watson-Stillman Co., Div'n of H. K. Porter Co., Inc., 201 Aldene Rd., Roselle, N. J. When equipped with proper dies it will also accommodate thermoplastics material. The self-contained unit has a 15 ton press tonnage, 6" stroke, and 2500 psi operating pressure. Platen size is 12" by 12" and daylight opening is 12".
Circle Inform-A-Gram No. E10.

Starting Formulations and resultant properties of "Thiokol" liquid polymer/epoxy resin casting compounds are described in a 12-page booklet issued by Thiokol Chemical Corp., 780 N. Clinton, Trenton, N. J. The compounds described display a high degree of resilience and impact resistance throughout a broad temperature range and have good resistance to water vapor transmission.
Circle Inform-A-Gram No. E11.

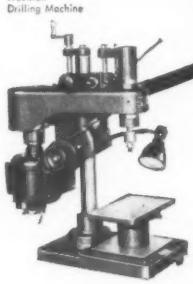
Model 16ES-400 Horizontal Injection molding machine by Watson-Stillman Co., Div'n of H. K. Porter Co., Inc., Roselle, N. J., features radial piston type motor driven pumping unit, semi-automatic control, rapid operating speeds, adjustable injection speed, and a plasticizing rate of 150 lbs. per hr. It has a 16 oz. shot capacity and 400-ton clamping force.
Circle Inform-A-Gram No. E12.

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC® Super Sensitive Variable Speed Small Hole Precision Drilling Machine



Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 5/16" in all drillable materials) is *super sensitive*. Provides speeds, *infinitely variable*, between 840 R.P.M. and 9300 R.P.M. Is built to *precision tolerances*, and with the stamina to *retain* precision.

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Hamilton, Ohio

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CIRCLE INFORM-A-GRAM KEY NO. 1431

MEN YOU SHOULD KNOW

Formation of an Electronics Division by Seneca Falls Machine Company was announced recently and **Robert H. Eisengrein** has been appointed Director of the new division. Prior to joining Seneca Falls, Mr. Eisengrein was Chief Research Engineer at Sundstrand Aviation.

◆

The expanding business of the Brehm Division of The Steel Products Engineering Co., Springfield, Ohio, has necessitated the appointment of an Assistant Manager of the Division. **Walter E. Callison,** a Sales Engineer for the past four years, is Assistant Manager of the Brehm Die Division, and will work directly with the District Sales Representatives in the United States and Canada.

◆

John L. Patterson has been appointed General Manager of Alcoa's Fabricating Division, succeeding **James P. Haight,** recently appointed to the newly created post of Chief Engineer for the Aluminum Corporation of America.

PDQ
QUICK CHANGE
MICROMETER
BORING BAR
by PORTAGE
FEATURES...
★ Precision Accuracy.
★ Tool offers new ease in operator adjustment.
★ Micrometer-adjusting screw is not exposed to dirt and chips . . . entire screw is enclosed in the bar.
★ Wedge Clamp offers positive locking of the tool bit.
This newly designed and patented micrometer boring tool offers additional features not found in other precision boring tools. All of the critical precision parts of the tool are completely enclosed and protected in the bar itself. Wedge clamp design offers a new standard in tool bit holding power and overall bar rigidity.
Write for literature covering ALL the features of this new tool.
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PORTAGE Double-Quick TOOL CO.
1046 SWEITZER AVENUE • AKRON 11, OHIO
CIRCLE INFORM-A-GRAM KEY NO. 1441

James H. Moore, General Manager of Vacuum Metals Corporation has announced the appointment of **Alfred H. Lewis** as Sales Manager, with headquarters at the company's new plant in Syracuse. Mr. Lewis was formerly Branch Sales Manager at Syracuse for Crucible Steel Company of America, part owner of Vacuum Metals.

◆

The P. O. McIntire Co., Cleveland manufacturer of POMCO boring and reaming tools and designer and builder of special tools, has announced the election of **Sam J. Forbes,** former President, as Chairman of its Board of Directors. **Charles D. Shannon,** former Vice President and General Manager, has been appointed President, and **Alfred G. Gogiin,** former Superintendent, moves up as Vice President and General Manager.

◆

Promotion of **Arthur B. Warner** from Assistant Plant Manager to Factory Superintendent at the main plant of Minnesota Rubber and Gasket Co., has been announced by Paul T. Dennison, President of the Minneapolis firm.

◆

The newly appointed Quality Inspection Supervisor for the Chrysler Corp. is **William P. Balthrop.** Mr. Balthrop received his Master's degree in automotive engineering from the Chrysler Institute of Engineering in 1946 and has held various engineering positions with the company since that time.

◆

Former Treasurer and Factory Manager of Chicago Wheel & Mfg. Co.'s Valparaiso, Ind. plant, **Arthur J. Miller, Jr.** has been elected President of the company. He succeeds **A. J. Miller, Sr.,** who was named chairman of the Board.

◆

Admiral Alan G. Kirk, Chairman of the Board of the Mercast Corp. for the past year has been elected President of that organization. From 1949-52 Admiral Kirk served as Ambassador to Russia, and in World War II, he commanded the Normandy Invasion.

◆

Clearing Machine Corp., Division of U. S. Industries, Inc., has two new executive changes to announce. **E. P. Cunningham** is Vice President in charge of Sales and **Albert Clements,** formerly General Manager of Clearing's plant in Hamilton, Ohio, will now head this plant as Vice President.

MEN YOU SHOULD KNOW

Earl P. Leeds has been named Director, Industrial Products Sales, Brown & Sharpe Manufacturing Co. Transferring from Machine Tool Sales, Mr. Leeds is now responsible for the sale of all small tool, cutter, and general goods items.

◆

E. W. Bliss Co., Canton, Ohio, announces the appointment of **C. A. Chamberlain** to the position of company Secretary. Mr. Chamberlain will assume his new duties in addition to those of Assistant to the President. He has been with Bliss since 1940, and headed its Torpedo Division in Brooklyn during World War II.

◆

Conde Hamlin, Vice President in charge of Sales and a Director of DeWalt Inc., has been elected Executive Vice President of this American Machine & Foundry Company subsidiary. DeWalt Inc., Lancaster, Pa., manufactures power cutting tools.

◆

The Hydraulic Press Mfg. Company of Mount Gilead, Ohio, has announced the appointment of **Archie F. Wilson** as Director of Manufacturing. Prior to coming to H&M, Mr. Wilson was Manager of Pick Operations at the Mather Stock Co. of Chicago. In this position he supervised operations of the firm's eight plants throughout the nation.

◆

Graham B. Brown has been appointed Works Manager of the Tube Reducing Corporation of Wallington, N. J. Before joining Tube Reducing in 1951, Mr. Brown served as Iron and Steel Advisor to the Munitions Board, and Chief of the Material Requirements Board. Office of the Secretary of Defense.

◆

Three executive appointments in the Marine and Industrial Engine Division of Chrysler Corp. were announced recently by Robert T. Keller, Division President. They are: **E. C. Freeman** as Factory Manager; **Norman R. Reno** as Master Mechanic; and **Robert W. Fries** as Planning Superintendent.

◆

Philip V. Tarr, recognized authority and author on powder metallurgy, is now Chief Engineer and Secretary of Nut Corporation of America, manufacturers of powdered metal nuts. Mr. Tarr is an officer of the American Society for Testing Material and is attached to the standards and design handbook committee of the Metal Powder Association.

Robert Potter, Vice President and Manager of the Salem, Ohio, Division of the E. W. Bliss Co., has been named to the office of Assistant Executive Vice President. He will be located in the company's general offices in Canton, Ohio, and will assist in the general supervision of the manufacturing divisions and subsidiaries. **George Perrault, Jr.,** former Sales Manager of the Rolling Mill Division, has succeeded Mr. Potter as Salem Division Manager.

Joseph P. Costigan, formerly Operations Manager of Alloy Rods Company of York, Pa., was recently named Works Manager of American Machine & Foundry's Buffalo plant.

◆

Louis P. Smith, former Vice President and Plant Manager of the Ithaca plant, Morse Chain Co., has been named Vice President of Manufacturing Operations of the whole company, according to an announcement from that Borg-Warner Corp. subsidiary.

5410

NOW CUT COST OF PRECISION GEAR PRODUCTION

THIS FEATURE: "*Independent* selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,

AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.

THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,

CONTRIBUTES to more gear precision with no sacrifice of gear production,

OR INCREASED gear production with no sacrifice of gear precision, ... OR BOTH!

Prices and specifications without obligation

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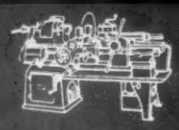
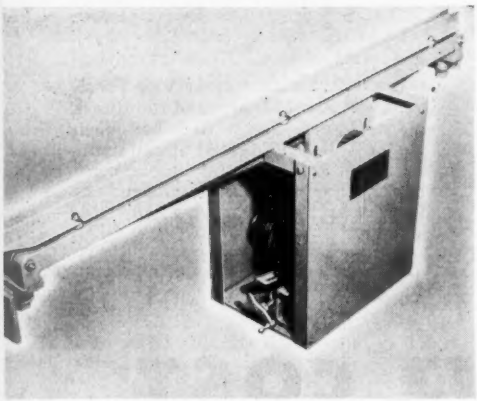


PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



CONVEYOR . . .

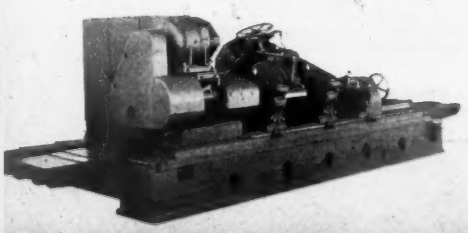
This Model 1600 Feedall transfer conveyor through feeds cylindrical work to centerless grinders, inspection machines, etc. The self-contained unit is powered with a ¼ hp, 220/440 volt, 3-phase motor. A variable speed drive controls feed rate and a range of 7′ to 28′ per min. is available. Feedall Machine & Engineering Co., Willoughby, Ohio.
Inform-A-Gram No. A1.

12″ LATHES . . .

The extra strength of the new Logan "2500" lathes is distributed through wider gears, larger shafts, and heavier bearing supports and base, resulting in more power and smoothness, minimum vibration. The "2500" line consists of eight lathes, four turret and four screw cutting models. Contact Logan Engineering Co., 4908 Lawrence Ave., Chicago 30, Ill. **Circle No. A2.**

TOOL GRINDER . . .

Two new tool grinders are being introduced by Ex-Cell-O Corp., Detroit. Both are double-end models, suitable for sharpening all types of tool materials. Features include reversible motors and large, easily adjusted tool rest tables. Style 49-A, a heavy-duty, 14″-wheel model, is pictured. Style 46-D is a 6″-wheel, general purpose grinder.
Inform-A-Gram No. A3.



ROLL GRINDER . . .

The new Landis grinder will take rolls weighing up to 25,000 lbs. It swings 36″ diameter work and will do crowning, concaving, and tapering. Lengths between centers are from 120″ to 240″. Landis Tool Co., Waynesboro, Pa.
Inform-A-Gram No. A4.

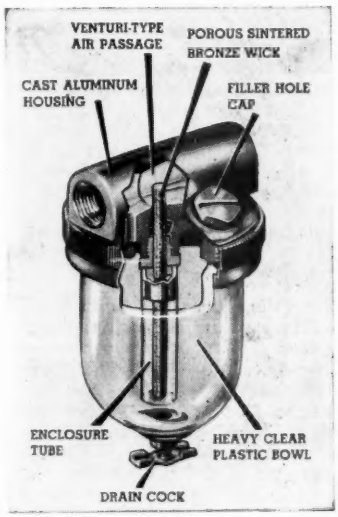
FLAT STEP DRILLS

The ground form relief design of these B & W flat step drills for non-ferrous metals provides ample chip clearance. The radial relief makes for low frictional drag and eliminates excessive heat, promoting faster drilling

and reaming and preventing excessive wear. No tool room equipment is required for regrinding these sturdy drills. B & W Precision Products, Co., 11393 E. 8 Mile Rd., Box 3865, Detroit 5, Mich. **Inform-A-Gram No. A5.**

AIR LINE LUBRICATORS

The redesigned Keller air line lubricators permit a wider range of feed rates, air volumes, and oil viscosities. They employ a porous sintered bronze wick with a new clear plastic enclosure tube to provide two oil feed ranges — a high range using the enclosure tube and a low range with the



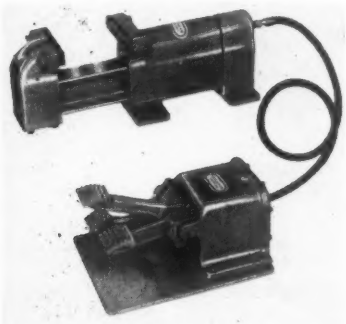
tube removed. Further variation of flow is obtained by adjusting the wick height. Two orifice inserts can be used to reduce the rated air capacity for low air flow applications. The new wick enclosure tube allows the use of a wide selection of lubricating oils. Additional information is available from the Keller Tool Co., Grand Haven, Mich.
Circle Inform-A-Gram No. A6.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

VISE-PRESS

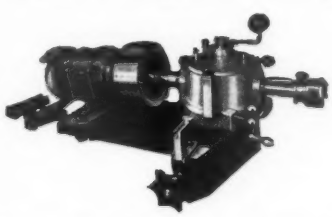
The new and improved hydraulic bench vise and press by Railcens has removable jaw plates and a divided front head for punching, broaching, and removing gears, pulleys, etc. from long jaws. Special jaw plates can be made for bending, forming,



and pressing. This unit can be used horizontally or on end. The hydraulic pump will build pressure up to 5,000 psi. All operations are controlled by foot. For more information write to Railcens, 120 N. Wisner St., Jackson, Mich., or— **Circle No. A7.**

MILL GRINDING FIXTURE

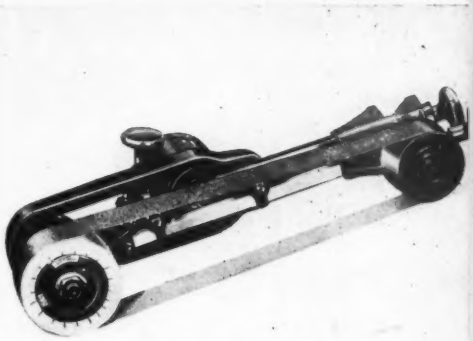
The "Multi-Spiral" is a self-contained end mill grinding fixture that makes it easy to sharpen end mills right in the shop. The detachable head may be removed from the fixture and used in combination with cutter-grinders and milling machines for spiral milling, flute grinding,



step grinding tools, web-thinning, and other similar operations. Overall size is 31" long, 18" wide, and 16" high. The "Multi-Spiral" has a reversing motor for left hand mills, eliminating throwing burr on the cutting edge. Contact Spiral Step Tool Co., 5400 N. Damen Ave., Chicago 25, Ill., for further information.
Circle Inform-A-Gram No. A8.

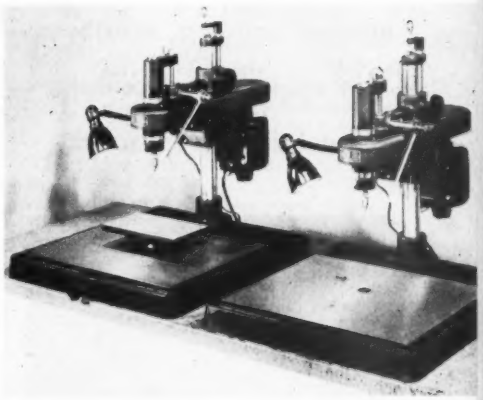
BELT GRINDER . . .

Model 500 Contact Wheel Belt Grinder by B & E Manufacturing Co., Inc., 407 Liberty St., Kansas City, Mo., can be mounted on a bench, pillar, portable table, or any convenient place in the shop, for finishing any material. An adjustment of 360° vertically makes it possible to place the grinder at the most advantageous point for visual and physical comfort. **Inform-A-Gram No. A9.**



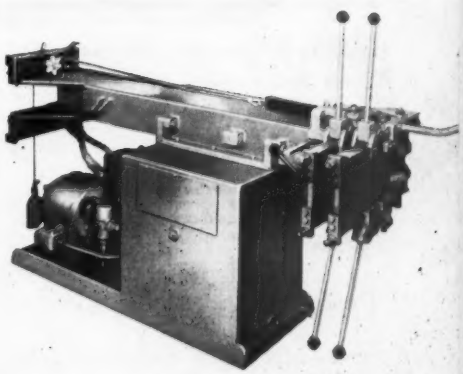
THE "MAXIMUS" . . .

This super-sensitive large table drilling machine is designed to drill small holes (0.004" to 5/16") in all drillable materials. Four spindle speeds are obtained through one of four available drives. Auxiliary demountable work tables for small work can be supplied. The drilling unit locks in any position. The Hamilton Tool Co., 832 S. 9 St., Hamilton, Ohio. **Circle No. A10.**



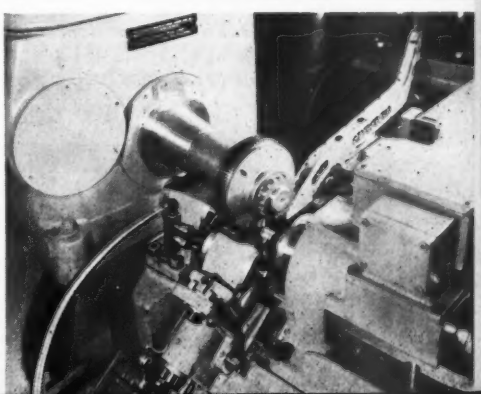
TWO-WAY BENDING . .

This horizontal, semi-automatic tube bending machine is for both clockwise and counter-clockwise operations. The unitized head and top assembly on the Pines Series 1400-A is double-hinged to the base to permit turning over the entire assembly 180°. Maximum capacity is 1" O.D. 16 gauge steel tubes. Pines Engr. Co., Inc., 601 Walnut St., Aurora, Ill. **Inform-A-Gram No. A11.**



DUO-MACHINING . . .

With the No. 8 Fellows "Full-tool" Gear Shaving machine as basic machine it is possible to chamfer and shave gear teeth at the same time, as this photo shows. The Fellows Gear Shaper Co., Springfield, Vt. **Circle No. A12.**



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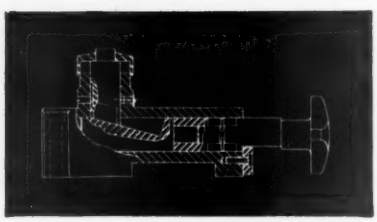
Why go through the costly motions of making your own jig and fixture parts? **Lodding** mass-produced line is as handy as your nearest Lodding distributor —in all industrial centers— to meet your every need.



Lodding Heavy-duty Jack Assembly is the modern way to support work while machining. Makes obsolete makeshifts like screw jacks and shims. Made in three sizes.

Fast . . . . positive . . . . accurate.

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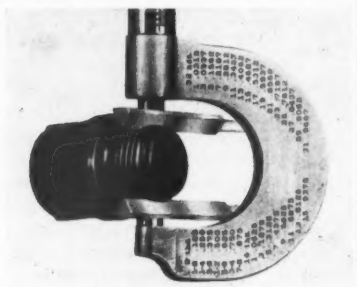
THE STANDARD LINE
OF JIG AND FIXTURE COMPONENTS

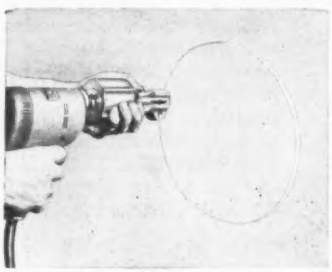
CIRCLE INFORM-A-GRAM KEY NO. 1481

Thread Triangle Gauges are two triangular shaped bars used for thread measuring all threads. They are easier to use than wires, because the mike anvils rest on flat parallel surfaces instead of on a round wire,



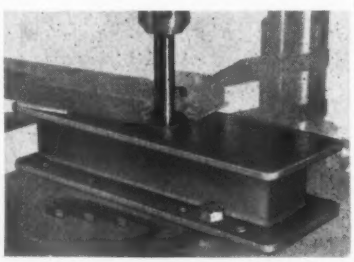
and they work on all 60 degree threads from 4 to 56 pitch, standard thread or non-standard, on any O.D. Get more information from Montgomery Tool Sales, Box 1241 Church St. Post Office, New York 7, N. Y.
Circle Inform-A-Gram No. A13

Power Sawing with power from electric or air drills is possible with the Saw-Mor Power Hack-Saw, reciprocating saw attachment that fits both ¼" and ½" drills. The device attaches directly to drill spindle, or



may be inserted into drill chuck. Special blades are available for cutting plastics, stainless steel, monel, and other metals. Saw-Mor Tool & Blade Co., 520 Machinery Hall Bldg., Chicago 6, Ill.
Circle Inform-A-Gram No. A14

Precision Boring is the feature of a new drill press boring fixture by The Donnell Co., St. Joseph, Mich. The unit is recommended for boring holes from ½" to 2" in free machin-



ing mild steel up to 1¼" thick, and can be used even for small drill presses. The precision boring "package" consists of boring bar, auxiliary work table, four cutting bits, and Allen wrench.
Circle Inform-A-Gram No. A15

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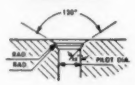
PRODUCE
A.N.D. 10050
PORT CONTOURS
3 TIMES FASTER!



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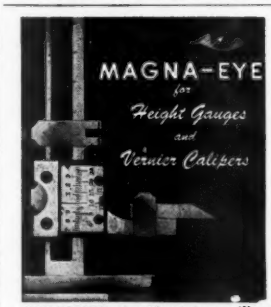
The new Sonnet Port Contour Cutter completes all five operations in one pass!

Chamfering, counterboring, radiusing, countersinking, spot facing... all five are necessary to produce the A.N.D. 10050 port contour or connecting hole. Now, with Sonnet's new four-fluted, special-purpose contour cutter, all five operations can be completed with a single pass, *reducing job time as much as two-thirds!*

The new cutter is made from alloy steel and hardened for toughness. Carbide tips on all four flutes assure longer cutting life and smoother finish. Available in all sizes with integral or replaceable pilots.

Sonnet
TOOL AND MFG. CO.
576 No. Prairie Avenue, Hawthorne, California
Specialists in carbide and high speed steel cutting tools

CIRCLE INFORM-A-GRAM KEY NO. 1482



MAGNIFIES "Hard-to Read" Vernier Scales on Height Gages and Calipers

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. S No. 100 for 6" Vernier Calipers; S No. 200 for 10", 12" Height Gages, also 10"-18"-24" Vernier Calipers; S No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" and 60" Calipers.
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STEBAR COMPANY
711 W. Lake St. Minneapolis 8, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1483

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since 1907
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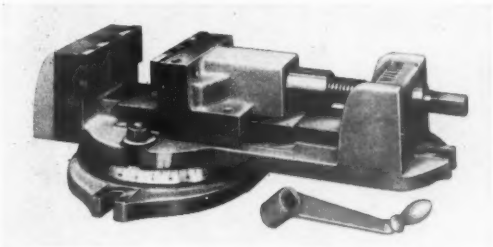
THE SHORE INSTRUMENT & MFG. CO., INC
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

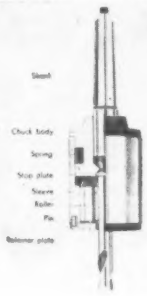
CIRCLE INFORM-A-GRAM KEY NO. 1484

The First Two Models of a new line of precision, heavy-duty vises for use on milling machines and other machines are available from Wilton Tool Mfg. Co., Inc., 925-941 Wrightwood Ave., Chicago 14, Ill. The new

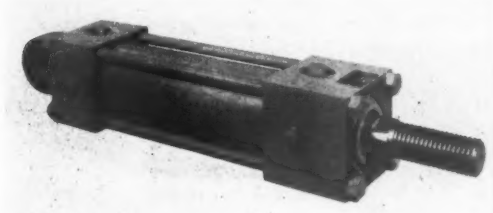


vises have a maximum opening of 6¼" and weigh 133 lbs. They are available with graduated swivel bases or stationary flanged bases. **Circle Inform-A-Gram No. A16**

Drill Chuck. Here's a self-centering drill chuck that permits safe, quick change of drills, reamers, and other straight shank tools while the machine is running. Three hardened, precision ground rollers replace the conventional type jaws. There are no interlocking parts, and none of the parts are subject to heavy wear. The Centric self-centering drill chuck comes in five sizes with capacity range from 1/32" to 3/4". Centric Tool Co., 3407 Carolina Ave., Rockford, Ill., will supply additional information.
Inform-A-Gram No. A17

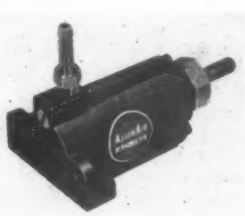


Series "S" Cylinders can be operated by either air or oil with operating pressures up to 1,000 psi. The units comply with both the JIC pneumatic standards and the JIC hydraulic standards and their application covers a



wide field. Series "S" cylinders are offered in bore sizes from 1½" to 8" and in seven mounting styles as standard catalog items. Hydro-Line Mfg. Co., 5769 Pike Rd., Rockford, Ill. **Circle Inform-A-Gram No. A18**

This Spring Return Air Clamp of 1⅛" bore and 1" stroke features cast bosses for either horizontal or vertical mounting and threaded nose piece. The clamp is furnished with one hole plugged and the other fitted with a brass barbed connector for standard ¼" hose. The piston rod is of stainless steel and threaded on the front end. A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, manufactures this Model AC-1x1 "Allenair" clamp.
Inform-A-Gram No. A19



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SCREW THREAD
MEASUREMENT
AT *Amazing*
LOW COST

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THREAD
MEASURING
GAUGES
FOR SCREWS AND TAPS

INSERT
Expand coil by depressing lever and insert screw

MEASURE
Take reading over coils

COMPARE
Check reading with limits on data plate

The MIM gauge gives the actual size of the thread and the pitch diameter —without the use of calculations or reference tables. Determines the strength and interchangeability of the thread. Indicates whether it is within standard limits.

The MIM gauge operates on the three-wire principal — recognized as the most accurate and satisfactory.

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¼" to 1"
Including new Unified Thread Series

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We absolutely guarantee these gauges to be free from defects in material and workmanship. You must be 100 per cent satisfied or your money will be refunded at once.

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Please rush on 10-day trial offer with money-back guarantee:

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CIRCLE INFORMA-GRAM KEY NO. 1491

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The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

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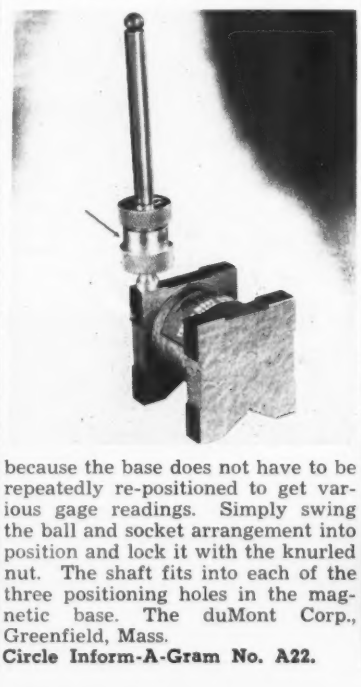
CIRCLE INFORM-A-GRAM KEY NO. 1501

Miniature Threading Dies. The threaded outside diameter of the cutting end of the die permits simple and positive adjustment of a hex collar so that thread diameter may be varied over a range of 0.004".

These dies are available in high speed and carbon steel in sizes from 2-56 to 0000-360 with various pitches, including metric variations. Woodruff & Stokes Co., Inc., 353 Lincoln St., Hingham, Mass.
Circle Inform-A-Gram No. A20.

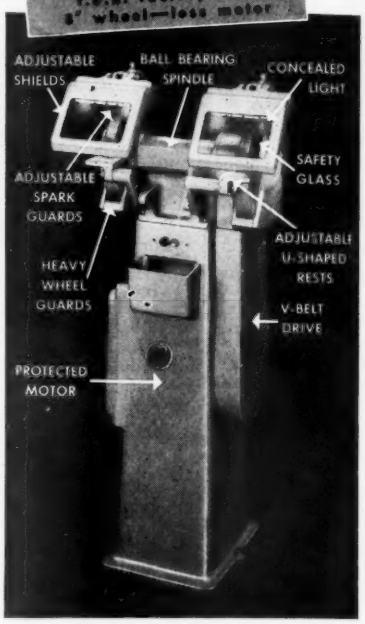
A New Grade of Sintered Carbide, Firthite TXL, gives increased hardness along with increased strength and provides greater wear and shock resistance in milling applications. This Firth Sterling carbide has an approximate Rockwell A hardness of 92 and strengths comparable to the stronger steel cutting grades. It is now available from Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Circle Inform-A-Gram No. A21.

Added Convenience and Time Saving in positioning dial indicator gages is achieved by the Universal joint shaft pictured. The new shaft permits a 180° vertical swing and 360° horizontal swing. The magnetic base permits a wider range of application



because the base does not have to be repeatedly re-positioned to get various gage readings. Simply swing the ball and socket arrangement into position and lock it with the knurled nut. The shaft fits into each of the three positioning holes in the magnetic base. The duMont Corp., Greenfield, Mass.
Circle Inform-A-Gram No. A22.

$245
f.o.b. factory with 8" wheel—less motor



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Pedestal GRINDER

A ruggedly built grinder that will give long, dependable service under hard use. Ideal for rough or precision grinding. The motor is enclosed in the pedestal and drives through a V-belt. This removes the weight of the grinding wheels from the motor bearings and practically eliminates vibration. Moreover, it isolates the motor from abrasive dust and provides greater work clearance.

SPECIFICATIONS

Wheel Size: 8" dia. (½ h.p. motor), 10" dia. (¾ h.p. motor).

Spindle: Approximate speed 2450 r.p.m. Sealed ball bearings.

Motor: Standard 2875 r.p.m. 50 cycle or 3450 r.p.m. 60 cycle. Also D. C.

Over-all Dimensions: 49½" high, 18" wide, 20½" deep (10" Grinder ½" wider).

8" —$245.00; 10" —$248.00 each f.o.b. factory less motor and remote control equipment. Time payment terms available.

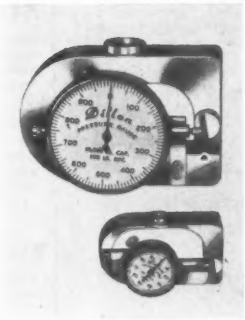
SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906

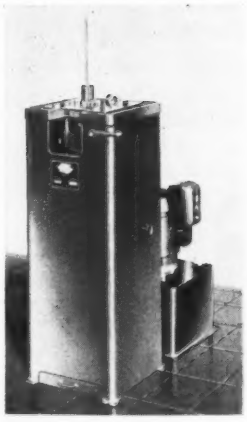
South Bend MACHINE TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1502

A Convenient Hand Lever quickly lowers a hardened steel table to permit entrance of the part to be checked on the Model BG103 Geneva Production Bench Gage, without the usual necessity of raising the indicator plunger to give adequate work clearance. This gage, manufactured by Chicago Dial Indicator Co., Dept. A, 180 N. Wacker Dr., Chicago, may be fitted with a foot pedal attachment.
Inform-A-Gram No. A23.

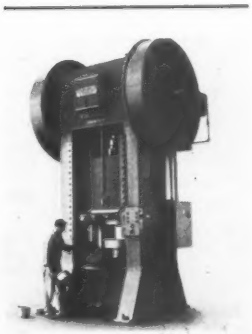
Measure Pressure. The new model Dillon "Pressure Gauge" measures compressive forces from 0 to 10,000 lbs with a warranted accuracy of within 1% of indicated reading and will sustain accidental overloads of up to 25% without injury or to calibration. This gage is available in 10 ranges, from 0-10 lbs to 0-10,000 lbs. All ranges from 0-100 lbs up can be supplied in tensile calibration. W. C. Dillon & Co., Inc., Box 3008, Van Nuys, Calif. **Circle No. A24.**





Broaching Machine. The Model VM215 is a vertical pull broaching machine providing up to two tons of hydraulic pulling power and 15" of cutting stroke. It cuts keyways or square, oblong, hexagon, irregular, splined, or round holes, and can be set up for surface broaching operations. Work table surface measures 16¼" by 16¼" and can accommodate large work. Machine height is 42" and it requires a floor area of 18" by 36", including reservoir unit. Contact Pioneer Broach Co., 6434 E. Telegraph Rd., Los Angeles 22, Calif.
Inform-A-Gram No. A25.

New Press Line. An entirely new line of high-production deep-draw presses is being introduced by the Steelweld Machinery Div'n of The Cleveland Crane & Engineering Co., Wickliffe, Ohio. The new Steelweld "Hi-Draw" presses are designed to operate at high speeds during the non-productive portion of the ram stroke and at a slower, correct drawing speed during the working part of the stroke.
Inform-A-Gram No. A26.



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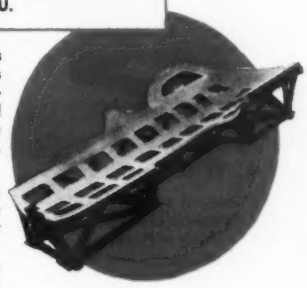

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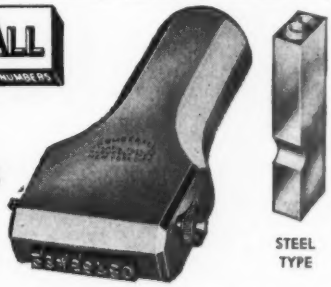
CUTS THE COST OF STAMPING NUMBERS

IMPROVED TYPE HOLDERS for stamping into Metal, etc.



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Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters.

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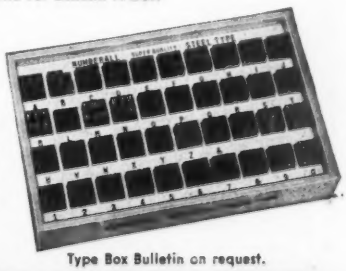

Type Box Bulletin on request.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1512

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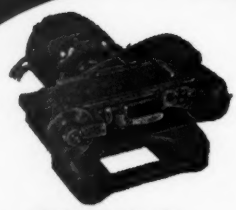
DOES IT FASTER



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The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

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Does jobs no drill can do!
up to 10 Times Faster than Boring!

NEW Clark
"HOLE-MAKER"

Totally new—maximum rigidity, no chatter! Roughs or finishes holes to exact size in FORGINGS, CASTINGS, BOILER PLATE, THIN STOCK, TUBING; CROWNED, CYLINDRICAL AND FLAT SURFACES. One of 3 blades is *always* in the cut on odd work shapes—*smooth action even on intermittent cuts!* Use new HOLE-MAKERS in radial drills, drill presses, turret lathes, portable electric or pneumatic drills, etc. Excellent for trepanning and rough boring I.D.'s in Tubing, Castings, etc...a real production tool!

Holes can't drift, spindle can't deflect—it's piloted 2 ways!

Cuts steels, plastics, transite, non ferrous metals, stainless steel, etc!

5 ADJUSTABLE SIZES: Specify Straight Shank or M.T. 2. 3. 4. Other tapers on order.

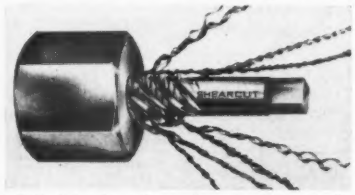
Models:	102	203	304	405	506
Capacity:	1" to 2"	2" to 3"	3" to 4"	4" to 5"	5" to 6"

Order from your dealer or write for catalog!

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.

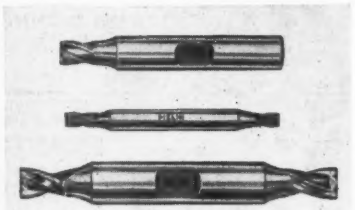
CIRCLE INFORM-A-GRAM KEY NO. 1522

Shearcut Super-Speed Thread Broaches are designed to operate at speeds from three to six times faster than normal. Made from high speed steel, the new taps are available in all standard sizes and pitches. An unusual feature is that they feed a



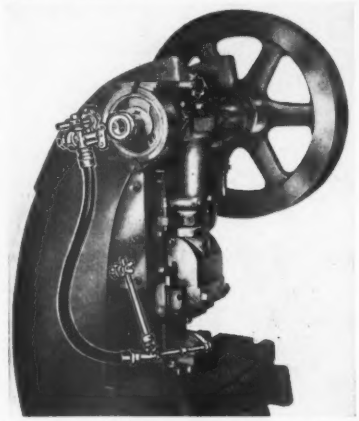
solid chip (as shown) out of the hole being tapped. Shearcut taps, manufactured by Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif., may be resharpened on any tool and cutter grinder; no special tools or fixtures are required. **Circle No. A27.**

Three Flute Mills, with flutes shorter than regular, in single and double end on 3/16" and 3/8" diameter shanks, have been added to



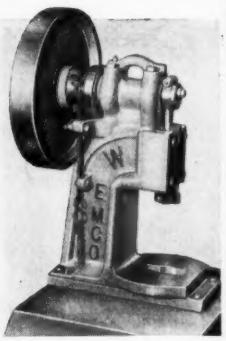
the Melin Tool line. They are hollow ground high speed steel with fast spiral flutes. Melin Tool Co., Inc., 3371 W. 140 St., Cleveland 11, Ohio. **Circle Inform-A-Gram No. A28**

A Delayed Action Air Blast Valve has been introduced to blow pieces of various weights from the press automatically at each turn of the crank shaft. Delayed action is required where a stamping is freed at



the top of the press stroke. This permits the operator to give his entire attention to loading the die. For full particulars on air blast valves, accessories and parts, write to F. J. Littell Machine Co., Air Div'n, 4197 Ravenswood Ave., Chicago 40, Ill. **Circle Inform-A-Gram No. A29**

EMCO "W", 5-ton bench type; also larger EMCO "X", 10-ton. Both sizes also stand-mounted. With or without motor drive.



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Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

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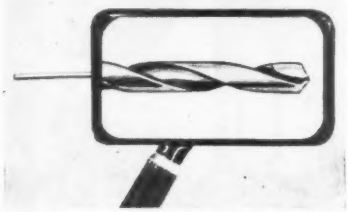
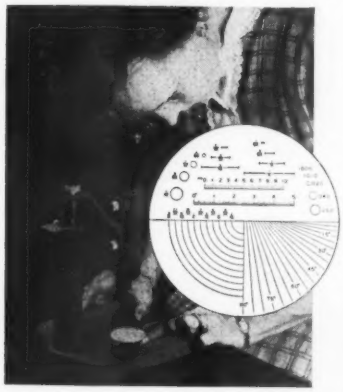
CIRCLE INFORM-A-GRAM KEY NO. 1524

Micro Drills in flat or spiral twist and made of high speed steel by Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill., have bright flutes



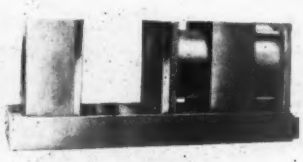
and are accurately ground for drilling very small holes. The micro drill size range is from 0.0059" to 0.0394".
Circle Inform-A-Gram No. A30

The Direct Measuring, Erect Image Microscope pictured is designed to utilize a pocket comparator of any make for accurate readings of dimensions, radii, angles, and holes. The microscope user views an object through a scaled reticle superimposed on the object being examined.



Both the image of the reticle and the object are magnified for easy measurement. Mounted on an industrial-type base, the instrument features rack and pinion focusing with a variable tension control and lock. Write to Edmund Scientific Corp., Barrington, N. J. for further information.
Circle Inform-A-Gram No. A31

"Vi-Speed Autovise," Model 663, is powered by spring return air cylinders with 19:1 ratio on any line pressure to 150 psi, with 3" stroke. The 6" by 6" jaws open to 8" on standard units. Jaw faces are re-



movable and can be drilled and tapped for attachment of fixtures and dies. Get complete information from Van Products Co., 5778 Old Ridge Rd., Swanville, Erie 7, Pa.
Circle Inform-A-Gram No. A32

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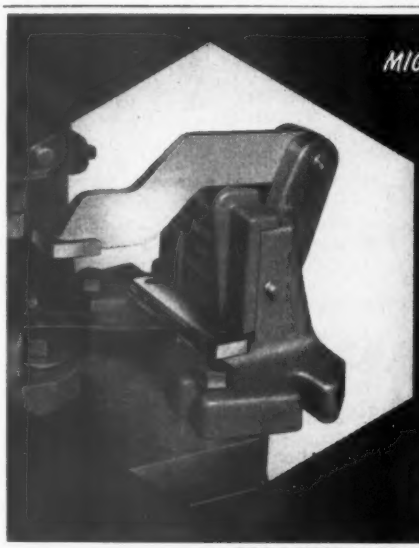

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ULTRA-CHEX GAGE BLOCKS *for Every Need!*

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34 BLOCK SET (shown)...$125 INCL. OPT. PARALLEL

82 BLOCK SET.....$275 IN CASE

These sets will supply the needs of any discriminating shop that must work to gage-block precision. IMMEDIATE DELIVERY

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For Individual Mechanic
$22.50
OPTICAL PARALLEL
$5.00 Extra

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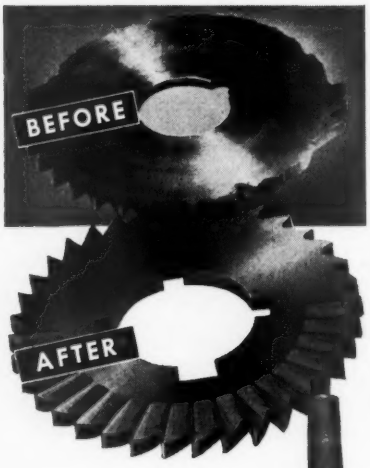
CIRCLE INFORM-A-GRAM KEY NO. 1533



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NATIONAL TOOL SALVAGE CO.
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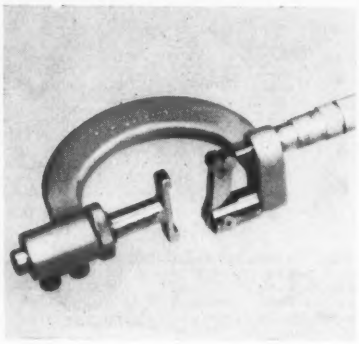
DETROIT 10, MICHIGAN

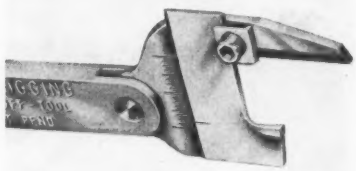
CIRCLE INFORM-A-GRAM KEY NO. 1541

Measure Taper while the piece is on the machine with the patented "Taper-Mike". The accuracy of the Taper-Mike allows measurement of the taper in tenths. You'll find that scrap loss is reduced because you no



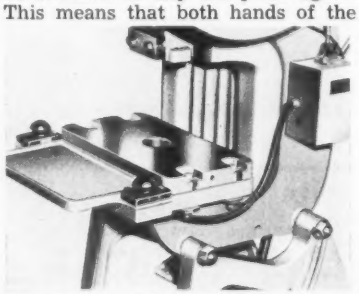
longer have the problem of trying to get the workpiece exactly on center again after measuring, for additional machining or grinding. Contact Taper Micrometer Corp., 100 Grove St., Worcester, Mass., for additional information about the Taper-Mike. **Circle Inform-A-Gram No. A33.**

"No-Hogging" Cut-Off Tool. The Northrup 2000 consists of a high speed steel blade, spring loaded blade holder, and steel shank. The tool face is always at work center be-



cause the tool acts as its own follower rest, eliminating hogging and chatter. The "No-Hogging" tool is available from H. D. Herder Tool Specialties, 2723 E. Michigan Ave., Kalamazoo, Mich. **Inform-A-Gram No. A34.**

The Press Operator must push two mushroom-type buttons in order to trip the press when the Searjeant two-hand electro-solenoid control is installed. Both buttons must also be released to trip the press again. This means that both hands of the



operator must be out of the danger zone while the press is set in motion. The control unit is made in several sizes and can be easily installed on almost any make or size of press. Searjeant Metal Products, Inc., Mendon, N. Y. **Inform-A-Gram No. A35.**

LINDERME 2-SPINDLE ADJUSTABLE DRILLING HEAD

Drills, taps metal, wood, plastics. 2-minute setup on most drill presses; quick, accurate adjustment. Variety of models, ½" to 12⅝" centers.

The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with overarm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drilling or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads.

Multiple heads with fixed center distances are designed and built to meet your requirements. Available with GM Sleeves, Morse taper or drill chucks.

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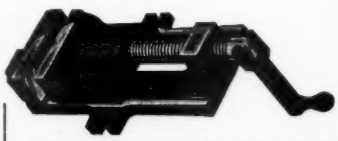

YOST DRILL PRESS VISE

• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

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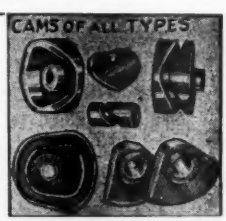

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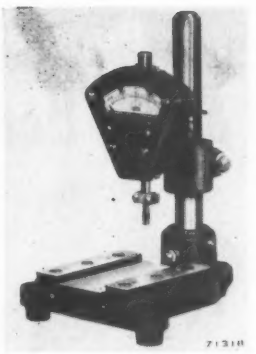
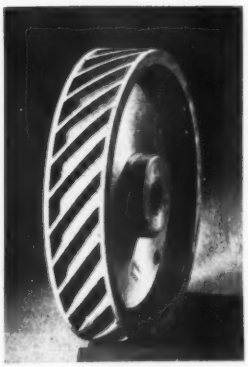
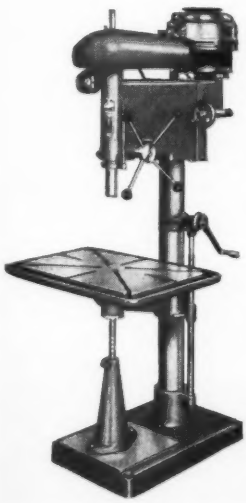


This Instrument fills the need for a rugged shop indicator gage. It is equipped with tolerance pointers and lifting lever which raises the spindle approximately ½". Removable rails on the base enable the user to design low cost gaging fixtures for checking internal and external dimensions. The Smith T & C Indicator Gauge head can be supplied without the base if desired. O-Vee Gauge Co., 2516 W. Vernon Ave., Los Angeles 8, Calif. **Circle No. A36.**



Contact Wheel. The "TF-54" contact wheel, developed by Chicago Rubber Co., and Minnesota Mining & Mfg. Co., is for coated abrasive belt polishing and finishing. Made of a new abrasive and oil resistant red rubber compound, it is lively and long-wearing, giving maximum conformability to curved surfaces, including acorn faucets, die casts, etc. The TF-54 is available from Chicago Rubber Co., 2640 N. Claybourn Ave., Chicago, in 20, 30, 40, and 60 durometer. **Inform-A-Gram No. A37.**

Coil Stock Grab. Dixon Model "H" stock grab lifts the coil from the inside diameter (as shown), greatly reducing the required headroom. It handles coils from ½" to 6" in width and has a radial capacity up to 13". Weight capacity is 1,000 lbs, with a 5 to 1 safety factor. For further information, contact the manufacturer, Dixon Automatic Tool, Inc., 2300 — 23 St., Rockford, Ill. **Inform-A-Gram No. A38.**



An Extra Large Table, 22" by 30", is featured on the Model E-25 drilling machine introduced by Silby Machine & Foundry Corp., South Bend, Ind. Other features which adapt the machine to heavy work are: drilling capacity of 1" in cast iron and ¾" in steel; 25" swing; coolant trough in table; full-floating ball bearing spindle with 8" maximum travel; 4½" diameter solid column; table accuracy to 0.007" in 6" radius; and variable drive from which the exact spindle speed may be obtained from any size drill from ⅛" to 1". **Inform-A-Gram No. A39.**

CIRCLE INFORM-A-GRAM KEY NO. 1551

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OF ONE-PIECE MOUNTING

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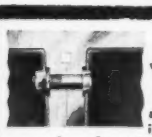
LAYOUT SURFACE PLATES

Precision ground or planer finished, Challenge semi-steel Layout Surface Plates provide a true, rigid surface for layout, inspection or assembly work. Plates can be grooved and keyed so that two or more can be mounted into one large complete unit. Write for new Challenge catolog.



Close up view showing how plates are bolted and keyed to insure a flat surface of unyielding strength. Available with grooving, scoring, or "T-Slots." 6" thick plates in 16 standard sizes - other sizes to order.

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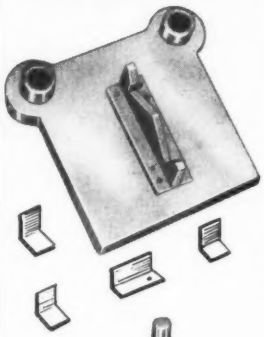
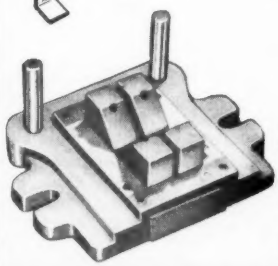
CIRCLE INFORM-A-GRAM KEY NO. 1561

Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2"x2"x¼" and lighter angles. Mounted in leader pin die set. Fits most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.



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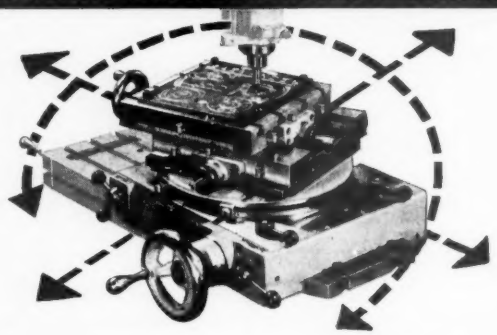
ADVANCE

CROSS-SLIDE ROTARY TABLE



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Make multiple radii and angle milling cuts accurately with only ONE set up! On your standard vertical mill, equipped with ADVANCE Cross-Slide Rotary Table, you can make all such cuts without re-clamping work. Size of radius you can cut is limited only by milling machine table movement. Ideal for molds, dies, patterns, etc.

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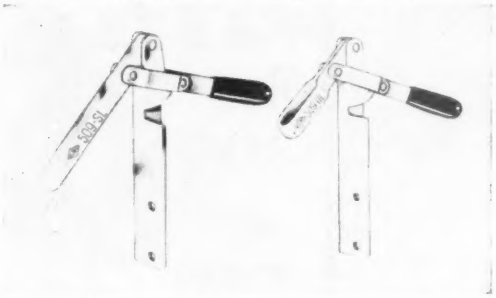
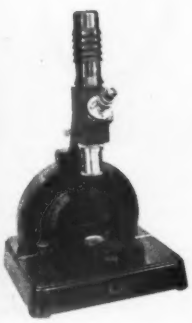
CIRCLE INFORM-A-GRAM KEY NO. 1564

Two New Clamp Models, the 509-U and the 509-S, feature low silhouette, complete clearance of working area, and "flop-over" action. The angular-flange base on these De-Sta-Co clamps permits mounting to the side of the fixture by bolts or welding. Model 509-U has a



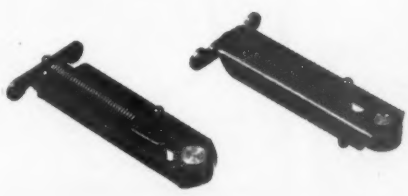
U-shaped holding bar and its use is recommended where welding facilities are not convenient. Model 509-S has a solid carbon-steel work-holding bar to which a wide variety of spindle assemblies may be attached. Detroit Stamping Co., Detroit, Mich. **Inform-A-Gram No. A40.**

Indicator Depth Gage. It is now possible to select a complete indicator depth gage for practically any production use with the standard series of interchangeable bars and gage pins being marketed by the A. G. Davis Gage & Engr. Co., 21435 Dequindre Rd., Hazel Park, Mich. All standard models have 0.200" adjustment. **Inform-A-Gram No. A41.**



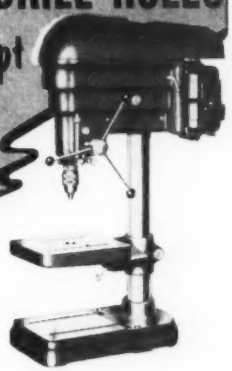
A Precision Angle Comparator that has wide applications in the metalworking field for comparing parallelism between two surfaces, squareness, and angles, is now being manufactured by The Perkin-Elmer Corp., Norwalk, Conn. The comparator operates entirely on optical principles and no pressure is applied to the piece being inspected. **Inform-A-Gram No. A42.**

Roller Stock Pushers for the alignment of strip stock against the back gage in progressive and compound dies are being manufactured by the Applied Mechanics Corp., Grand Rapids, Mich. The roller feature permits easier feeding to eliminate stock buckling and speed up pro-



duction. The nine precision models of Amcor Roller Stock Pushers are adaptable to all work specifications and easy to install. Applied Mechanics Corp. will send full information on their Amcor models. **Circle Inform-A-Gram No. A43.**

HANDLE JOBS AND DRILL HOLES of a Size No One Would Attempt On Other 15-Inch Drill Presses



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Give You 25% More Capacity — are 5/8" — not just the 1/2" capacity of other 15" and 14" machines.

- 56 High and Low Speed Bench and Floor Models. 1-2-3-4 Spindles.
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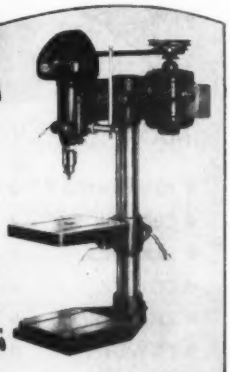

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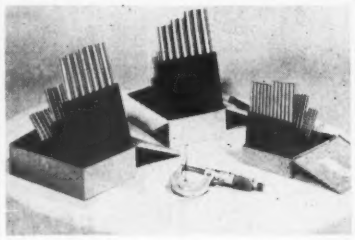
Drill Blanks. A complete package of high speed steel drill blanks ranging in sizes from 0.040" to 0.500" is being offered by The William T. Hutchinson Co., 235 Main St., Orange,



N. J. The 115 blanks are contained in three sets, each in an appropriate Huot case, and are recommended for gaging, injector pins, and the manufacture of special tools.
Circle Inform-A-Gram No. A44.

Collet Vise. A low-cost holding device for cylindrically-shaped parts up to ¼" in diameter has been put out by the Foredom Electric Co., 27 Park Pl., New York 7. "Chuxrite"

speeds set-ups on both short and long-run secondary operations on drill press, tapping machine, lathe, and milling machine, and may be used on the bench.
Circle Inform-A-Gram No. A45.

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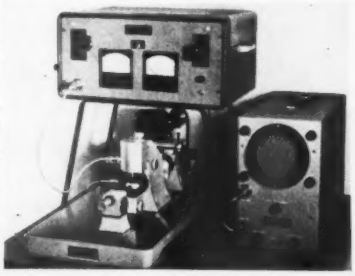

around a major circumference of the ball. Readings are shown by meter in micro-inches. An oscilloscope is furnished if desired. Micrometrical Development Corp., 2821 S. State St., Ann Arbor, Mich.
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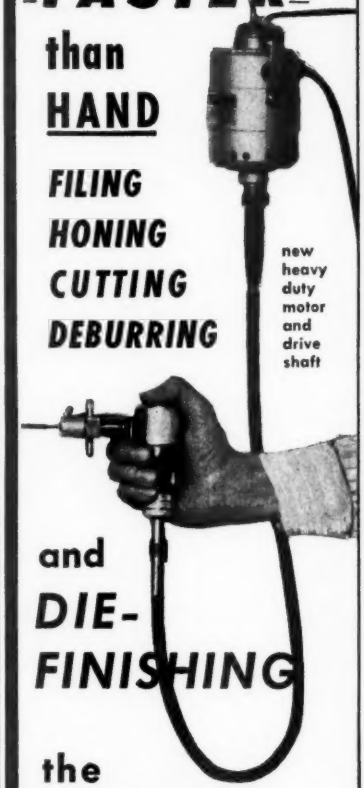

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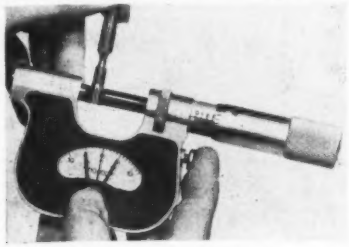
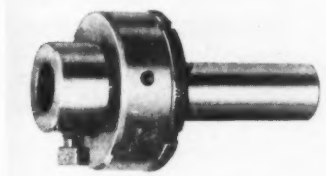
Indicating Micrometer. The "Master Compar" is really a master-micrometer and comparator combined. The range is from 0-1" reading in 0.0001"; tenths are read from the large dial. The indicating mech-



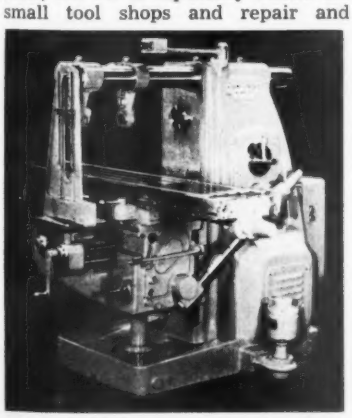
anism controls the measuring pressure so all uncertainties due to differences in "feel" by individuals are eliminated. George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y. **Circle Inform-A-Gram No. A47.**

A Free-Floating Positive Drive that maintains the axis of the reamer parallel to the centerline of the hole is one of the features of the improved self-a igning reamer holder manufactured by the Marcellus Mfg. Co.,



Belvidere, Ill. This parallel alignment feature is accomplished with a spring arrangement that is easily adjusted for tension to compensate for the overhanging weight of various sizes of reamers. **Circle No. A48.**

Model CE Milling Machines by Kearney & Trecker offer these valuable features — efficiency, ease and economy of operation. Available now in either No. 2 (3hp) or No. 3 (7½hp) sizes, the CE is especially suited for small tool shops and repair and



maintenance shops. Both sizes have 16 speeds (25 to 1300 rpm) and feeds (½ to 25 rpm). Contact Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis. **Circle No. A49.**

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Adaptor for drills or other tools.
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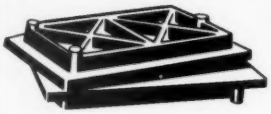

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12" x 12" — 40 lbs.	$22.00 ea.
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12" x 18" — 60 lbs.	30.00 ea.
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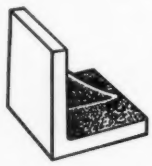

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Manufactured from exceptionally high quality castings. Pre-seasoning eliminates distortion possibility.

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3" x 3"	3.90	8" x 8"	19.25
4" x 4"	4.75	12" x 12"	50.50
5" x 5"	9.25		

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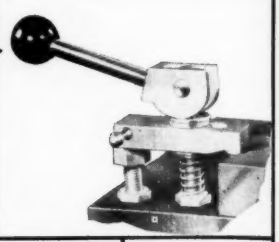

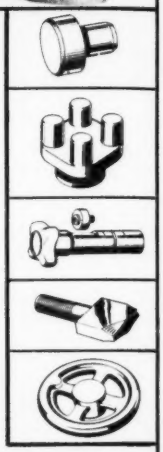

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CIRCLE INFORM-A-GRAM KEY NO. 1602

the ELLIS dividing head

Although it is built to fine instrument standards, the ELLIS is a really *rugged* tool room or production tool that's designed for unusual versatility. Its universal motions—swiveling in two planes—will save time and increase profits and accuracy on your millers, grinders, drill presses and jig borers. It has 6½" swing, or 11" swing when used with riser blocks. Work may be held between centers, or in chucks or collets. To save rehandling of work, and to save money, investigate the ELLIS by writing for complete details!

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NICHOLS-MORRIS CORP.

CIRCLE INFORM-A-GRAM KEY NO. 1603

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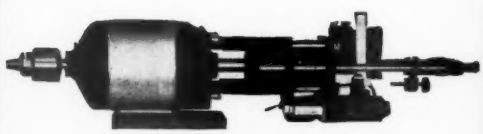

NO SPLINES — Self-contained units, at low cost, for drilling, tapping, chamfering, reaming and similar operations.

NO GEARS — New principle employs traversing motor shaft for work spindle, applies even torque with practically no end play. Drill has air feed for rapid advance to work—hydraulic control to completion of work cycle with uniform feed. Tapping unit controlled so tap follows its own lead without chamfering first thread or stripping threads on return stroke. Easy adjustment—depth accuracy to within .001".

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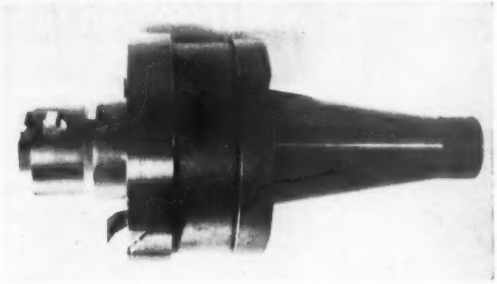
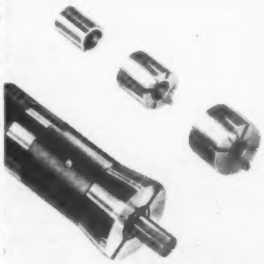
CIRCLE INFORM-A-GRAM KEY NO. 1604

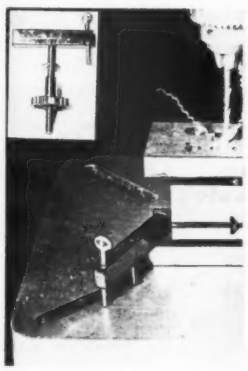
Special Boring Bars. Shown here are two patented types of replaceable blades available from Millit, Inc., for boring applications. The three step boring blades are solid carbide rectangles held in place by a round wedge. The two spot facing blades are standard Millit ¾" wide



attached blades. The bar itself is of hardened alloy steel with a No. 50 NMTB taper at one end. Millit, Inc., 49 Flint St., Rochester 8, N. Y., has a complete line of milling cutters and special carbide cutting tools. **No. A50.**

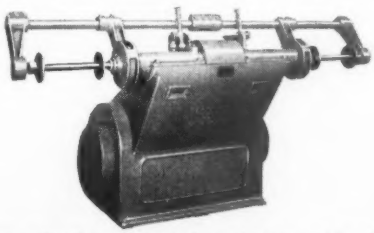
The "Hole-True" Collet Arbor is an expanding type for holding work parts internally to achieve precision concentricity for secondary or final facing, turning, machining, or grinding operations. It is actuated by the drawbar of the machine and no other parts are needed. Shown is a set of ⅜" Master Collet Arbor and adapter bushings. The Medelton Co., Inc., 335 E. 142 St., Bronx, 54, N. Y., manufactures the hardened steel, ground units. Because of internal holding, the entire length of the part may be finish machined. **Inform-A-Gram No. A51.**





A New Hold-Down Clamp for Drill Presses, etc., is the "Tee Clamp", latest addition to the Hunter Tool line. To use, the operator slips the head (top of the T) up through one of the cross slots in the press table, and then places the tip of the bar (opposite the thumb screw) over the object to be clamped. Adjust the thumb screw until the bar is parallel with the table. Hunter Tool Co., 6608 S. Gretna Ave., Whittier, Calif. **Inform-A-Gram No. A52.**

This Two-Spindle Hammond Model RRO wide swing polishing and buffing lathe is especially suited for large and irregular shaped parts. Each spindle has its own motor, motor control, and V-belt, allowing each operator



to change wheels without interfering with the other. For further information on the Hammond Model RRO, write Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich. **Inform-A-Gram No. A53.**

At Buckeye Tools Corp.-

STOCKROOM AREA CUT IN HALF, EFFICIENCY DOUBLED

In redesigning their toolroom to gain additional production space, engineers at Buckeye Tools Corp., Dayton, Ohio, reduced the actual area of the stockroom from 1800 to 900 square feet by using modern Rotabin storage methods for small parts. Each 34"-diameter Rotabin unit holds stock once requiring nine lineal feet of conventional shelving.

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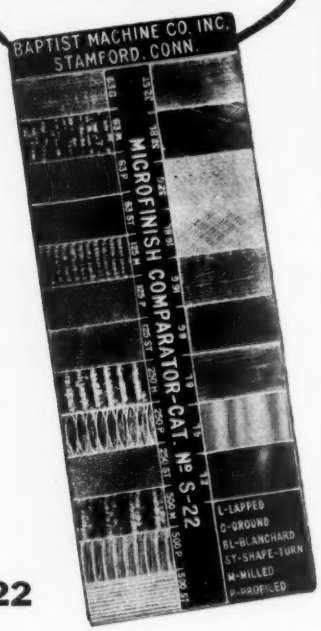

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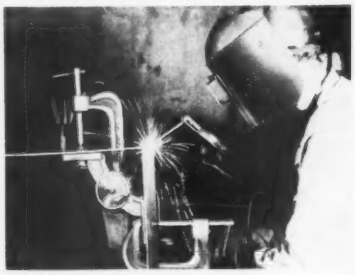
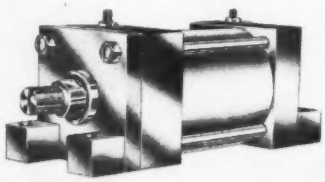
CIRCLE INFORM-A-GRAM KEY NO. 1621

The Duo-Square Adjustable Work Holder has two clamping faces that are adjustable from 0 through 180° and precision machined for perfect alignment. It is made of cast aluminum alloy which quickly dissipates



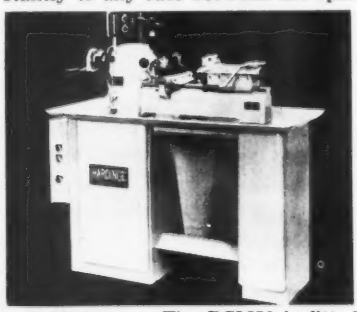
heat and eliminates adherence of weld splatter, and adjustments are controlled by a single machine handle. Jergens Tool Specialty Co., 712 E. 163 St., Cleveland.
Circle Inform-A-Gram No. A54.

A New Cylinder Mounting consisting of sturdy, thick, square mounting lugs that mount flush with Miller's standard square heads and caps to provide a space-saving mounting of great strength and rigidity is now being offered by Miller Fluid Power



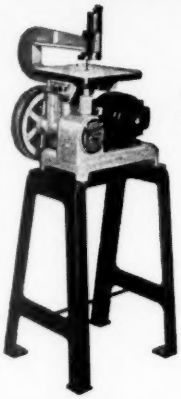
Co., 2040 N. Hawthorne Ave., Melrose Park, Ill. This Model 77 supersedes Model 71 and is available in 1½" to 20" bore in 200 psi air cylinders and 1½" to 12" bores in 2000 psi hydraulic cylinders.
Circle Inform-A-Gram No. A55.

Second Operation Machine. A touch of the button on this Model DSM59 Second Operation machine by Hardinge Brothers, Inc., Elmira, N. Y., changes the spindle speed instantly to any rate between 230 rpm



and 3500 rpm. The DSM59 is fitted with the new 5C round Hardinge collet and has an extra large (1-1/16") capacity. The machine does not have to be stopped to make spindle speed changes.
Circle Inform-A-Gram No. A56.

CUT TOOL AND DIE-MAKING COSTS WITH . . . Milwaukee DIE FILERS PROFILE GRINDERS



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. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

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Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

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SNOW RADIAL DRILL EXTENSION BASES and BOX TABLES!

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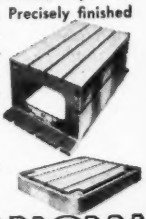

Send for bulletins BA-3-53 and 54.

Dept. TP

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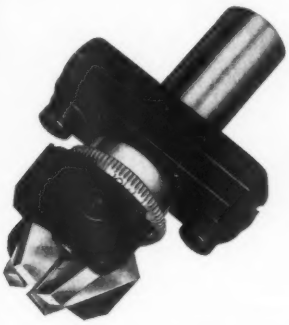
333 Old Hook Rd. Westwood, N.J. Westwood 5-3271

CIRCLE INFORM-A-GRAM KEY NO. 1623

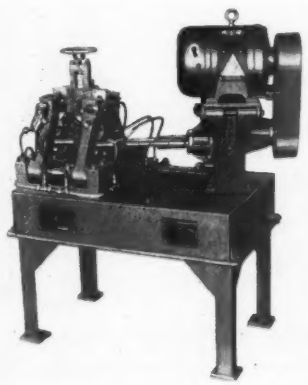
The Midget Floating Holder Hollow Mill by Carl Wirth & Son, Inc., has micrometric adjustment and is designed to permit easy compensation for any spindle misalignment.



Model No. 104 has a cutting capacity to 1/8" and Model No. 124, 1/8" to 1/4". Left hand mills are available. Carl Wirth & Son, Inc., 1625 Clinton Ave., N., Rochester 5, N. Y.
Circle Inform-A-Gram No. A57.

"Silent Sentry." Model TGS 150, will stop or change a machine or operation immediately if a person moves into the "protected area," preventing loss of fingers, etc. on all types of automatic machine tools and equipment. If power source or an internal part of the unit should fail, the machine will stop and remain stopped until the trouble is remedied. Write to R. G. Genzlinger, Inc., Neshaminy, Pa. for details.
Circle Inform-A-Gram No. A58.

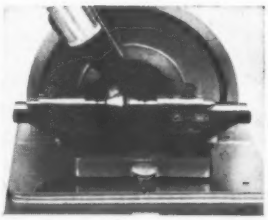
This Compact Straightener answers the need for the high production of short length, small diameter rods and tubes. A 7-roll straightening principle is employed in the pass line, providing ease of feeding, positive retention of tubing to pass line, and accurate end-to-end straightness



at continuous production speeds without use of guides. A special table mount serves as a reservoir for recirculating coolant. All rolls in the machine can be changed in less than 15 min. when necessary. Sutton Straightener, Model OOKTC, is a product of Sutton Engineering Co., Bellefonte, Pa. **Circle No. A59.**

Best Check for
Parallelism...
Squareness...
Angles...

Perkin-Elmer's Optical
ANGLE COMPARATOR



Checking taper angle (above). Checking micrometer for parallelism of anvil and spindle faces, thread runout and frame alignment (above, right).

Simplifies and speeds inspection of parts, even though difficult to approach by other means. Measurements read directly from graduated reticle. Operates entirely on optical principles—no physical contact with part required—precision is independent of the operator.

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In Large or Small Quantities

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NEW NORTON SERVICES-LEASING, REBUILDING, TRADE-INS AND TIME PAYMENTS

The Norton Company of Worcester, Massachusetts, will shortly announce the details of plans for the leasing, rebuilding, trading-in, and time payment arrangements on certain standard grinding and lapping machines.

On a leasing arrangement similar to that used by the Kearney & Trecker Corporation, including plans A, B, and C, Norton Company is prepared to lease fifteen standard machines.

Along with expanded rebuilding operations, Norton Company has compiled a list of nine specific machines subject to rebuilding for a firm price of 45% of the price of a corresponding new machine with the same equipment. Other Norton machines can be rebuilt but pricing will have to be determined in each case.

Recognizing that many replacement programs can be furthered if original equipment can be traded-in, Norton Company will consider such trades on a limited group of six readily salable machines.

Relative to the new machines which have been pegged as being available through lease, Norton Company is now considering plans for time payments. These arrangements will be handled through Norton distributors.

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. . . for it has the speed, accuracy and sturdiness you want — also the features to handle a greater variety of work — along with simpler, more thrifty operation and maintenance . . . Dollar for dollar you cannot buy a better, more practical press.

Significant savings are often achieved if you let our engineering staff assist you. There is no obligation.

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Rousselle Presses are sold exclusively through Leading Machinery Dealers

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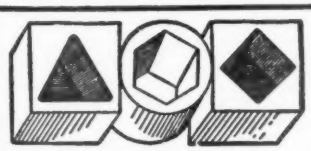

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HEIMANN MFG. CO. • URBANA, OHIO

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Abrasive Engineers 128
Ace Drill Bushing Co., Inc. 131
Acro Metal Stamping Co. 46
Advance Products 156
Affiliated Machine & Tool Co. 130
Aget Manufacturing Co. 155
Air-Mite Devices, Inc. 130
Alina Corp. 165
All American Tool & Mfg. Co. 129
Allegheny Ludlum Steel Corp. 101
Allen, Alva F. 125
Allied Products Corp.
Richard Brothers Punch Div. 34
American Drill Bushings Co. 5
American Positive Grip Vise Corp. .. 95, 160
Armstrong-Blum Mfg. Co. 110
Armstrong Bros. Tool Co. 116
Atlantic Gear Works, Inc. 163
Atlas Press Co., Clausing Div. 18

Balas Collet Mfg. Co. 167
Baptist Machine Co. 162
Barker Engineering Co. 129
Barth Corp., The 80
Bath Co., The Cyril 27
Bausch & Lomb Optical Co. 12, 153
Beaver Rotary File Co. 94
Bellows Co., The 3
Benchmaster Mfg. Co. 123
Black Drill Co., Inc. 160
Bliss Co., E. W. 86
BMT Manufacturing Co. 95
Bodine Corporation, The 85
Boice-Crane Company 157
Bokum Tool Co. 164

Cerro de Pasco Corp. 156
Challenge Machinery Co., The 155
Chandler Tool Co. 127
Chaso-Royco Tool Co., Inc. 98
Chicago-Latrobe 28
Cincinnati Milling Machine Co., The 77
Clark Co., Robert H. 152
Clarkson, Inc. 96
Clausing Div. Atlas Press Co. 18
Clearing Machine Corp.
Div. of U. S. Industries, Inc. 37
Cleveland Instrument Co. 152
Clinton Machine Co.,
Metalmaster Division 118
Cole Co., Walter T. 158
Colonial Bushings, Inc. 156
Comet Tool Co. 95
Commander Mfg. Co. 36
Crobalt, Inc. 131
Crucible Steel Co. of America 41

Danly Machine Specialties, Inc. 43
Darwin & Milner, Inc. 84
Dayton Rogers Mfg. Co. 86
Detroit Die Set Corp. 20
Detroit Stamping Co. 114
Detroit Tap & Tool Co. 24
DeVlieg Microbore Co. 81
Dickerman Mfg. Co., H. E. 138
Diemakers Products, Inc. 94
Die Supply Co., The
Sub. of E. W. Bliss Co. 33
duMont Corp., The 90, 94, 98
Dumore Precision Tools,
The Dumore Co. 22
Durant Tool Supply Co. 153
Dykem Co., The 99

Eisler Engineering Co., Inc. 154
Elgin National Watch Co. 86
Elk Tools, Inc. 122
Enco Mfg. Co. 102
Erickson Tool Co. 48
Ex-Cell-O Corp 109

Fairfield Gauge Co. 152
Fellows Gear Shaper Co., The 6
Ford Mfg. Co., Inc., M. A. 114
Foster Supplies Co. 86
Frick-Gallagher Mfg. Co., The 161
Fulton Foundry & Machine Co., Inc. .. 132.1

Gage Co. 126
Genales, Andrew 94
Gorton Machine Co., George 21
Greenlee Bros. & Co. 137
Gries Reproducer Corp. 97

Hamilton Tool Co., The 141, 143, 145
Hannifin Corp. 98
Hardinge Brothers, Inc. 10
Harig Mfg. Corp. 51
Hartford Special Machinery Co., The ... 117
Heimann Mfg. Co. 165
Hi-Shear Rivet Tool Co., The 123
Hovis Screwlock Co. 108
Huebner Publications, Inc. 92, 103
Humm Safety Equipment Co. 102
Hupp Corp. 140
Hutchinson Co., William T. 42
Hydro-Line Mfg. Co. 115

Index Machine Co. 142
Industrial Diamond Assoc. of
America, Inc. 126
Industrial Tectonics, Inc. 164

Jaco Devices, Inc. 164
Jacobs Mfg. Co. 93
Jergens Tool Specialty Co. 125, 132.3
Jones & Lamson Machine Co. 40

Kalamazoo Tank & Silo Co.,
Machine Tool Div. 88
Kasson Die and Motor Corp. 90, 128
Keller Tool Co. 30
Kennametal, Inc. 44
Kidde Precision Tool Corp. 90, 102
Klaas Machine & Mfg. Co. 152
Kling Bros. Engineering Works 106

Lakeside Steel Improvement Co., The 132.4
Lassy Tool Co. 114
Lavallee & Ide, Inc. 4
Lee Co., K.O. 130
Lempco Products, Inc. 31
Levin & Son, Inc., Louis 164
Linderme Engineering & Sales 154
Lodding, Inc. 148
Logan Engineering Co. 118
Logansport Machine Co., Inc. 129
Longley Co., Truman E. 132.4

Mayline Co. 98
M-B Products 131
Mead Specialties Co. 13
Melin Tool Co., Inc. 136
Metal Carbides Corp. 125
Metalmaster
Div. of Clinton Machine Co. 118
Metronic Institute 149
Meyers Co., Inc., W. F. 129
Micrometrical Mfg. Co. 131
Midwest Gage Laboratory
Div. of Size Control Co. 35
Mohawk Tools, Inc. 113
Moore Special Tool Co., Inc. 26
Morton Machine Works 132

National Tool Salvage Co. 154
Neise, Karl A. 159
Nichols-Morris Corp. 160
Nilson Machine Co., A. H. 104
Nord International Corp. 158
Northwestern 19
Numberall Stamp & Tool Co. 151

Oliver Instrument Co. 150
O'Neil-Irwin Mfg. Co. 50

Parker Stamp Works, Inc., The 32, 119
Perkin-Elmer Corp., The 163
Pope Machinery Corp. 134
Portage Double-Quick Tool Co. 144
Porter Precision Products 139
Pratt & Whitney
Div. Niles-Bement-Pond Co. 8, 9, 14
Precision Tool & Mfg. of Ill. 99
Preis Engraving Machine Co., H.P. 165
Producto Machine Co., The 11
Putman Tool Co. 1

Reid Tool Supply Co. 163
Ren-ite Plastics, Inc. 151
Rice & Co., Inc., Robert W. 90
Rice Pump & Machine Co. 162
Richards Co., J. A. 97
Richard Brothers Punch Div.
Allied Products Corp. 34
Robbins Co., Omer E. 107
Roll-Feeds Corp. 125
Rotor Tool Co., The 105
Royal Oak Tool & Machine Co. 135

Sales Service Machine Tool Co. 120
Scherr Co., Inc., George 126, 130, 153
Scully-Jones & Co. 121
Service Machine Co. 165
Severance Tool Industries, Inc. 115
Shaker Tool & Die Co. 114
Shore Instrument Mfg. Co., Inc. 148
Size Control Company,
Midwest Gage Laboratory Div. 35
Snow Co., Ferdinand J. 162
Sonnet Tool & Mfg. Co. 148
South Bend Lathe Works 150
Spiral Step Tool Co. 16
Spring Specialty Co. 99
Standard Gage Co., Inc. 29
Standard Parts Co. 100
Standard Pressed Steel Co. 38
Stebar Co. 148
Superior Hone Corp. 97
Superior Steel Products Corp. 89

Technical Scientific
Instruments Corp. 122
Tomco Products Co. 90
Tool Design & Equip. Co. 130
Torrington Co., The 111

U. S. Diamond Wheel Co. 130
U. S. Industries, Inc.
Clearing Machine Corp., Div. 37
Universal Engineering Co. 17

Valvair Corp. 47
Van Products Co. 165
Verson Allsteel Press Co. 168
Vulcan Tool Co. 78, 91, 115

Wadell Tools 83
Wales-Strippit Corp. 39
Walls Sales Corp. 152
Walton Co., The 118
Ward Machinery Co. 156
Wardwell Mfg. Co., The 140
Watts Bros. Tool Works 165
Weldon Tool Co., The 132
Wells Mfg. Corp. 126
Wesson Co., Affiliated with
Wesson Metal Corp. 52
West Point Mfg. Co. 160
Wheel Trueing Tool Co. 2
Whistler & Sons, Inc., S. B. 112
Whitney Metal Tool Co. 95
Wickman Mfg. Co., The 159
Woodson Tool Co. 122

Yost Mfg. Co. 154

Zagar Tool, Inc. 25

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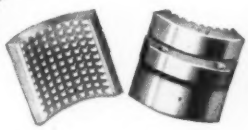

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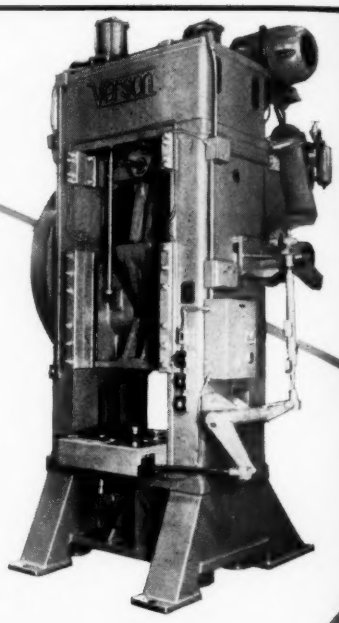

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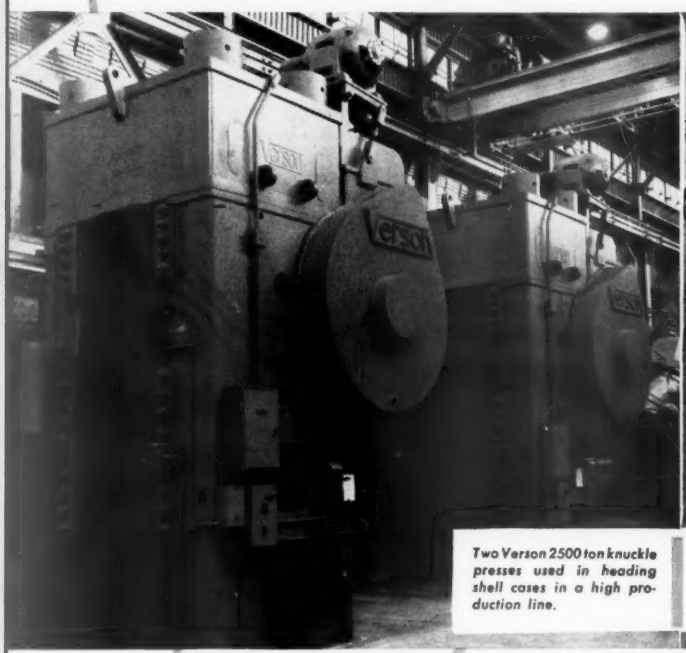
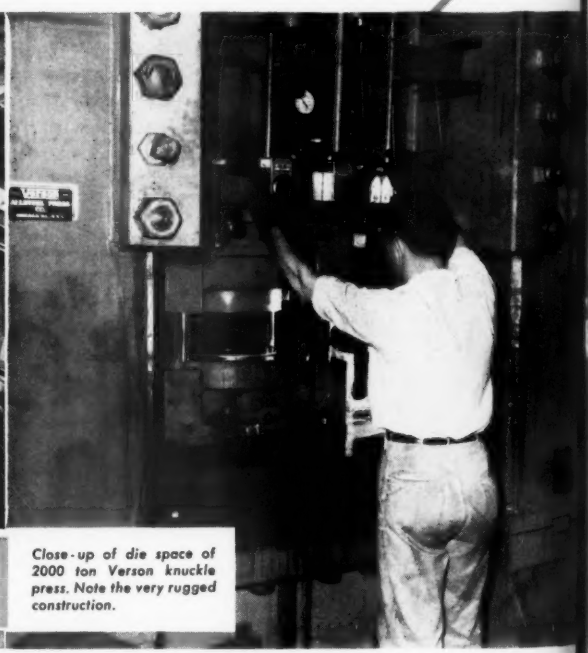


Two Verson 2500 ton knuckle presses used in heading shell cases in a high production line.



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